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PATENT ABSTRACTS OF JAPAN

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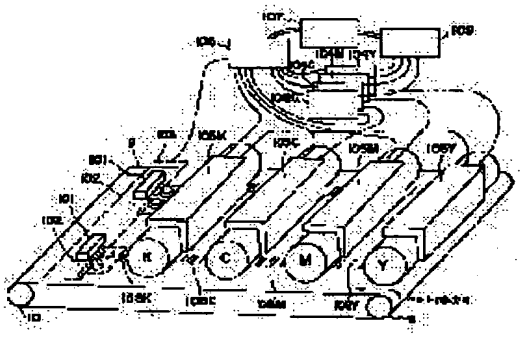
(54) IMAGE FORMING DEVICE

(57)Abstract:
PURPOSE: To form an excellent image with a little shear in color by providing a system for determining an image position measuring pattern by making sensors output by time sharing and synthesizing measured results of the image by respective sensors.
CONSTITUTION: When a correction cycle starts, a positional shear measuring pattern is sent to an image forming device 105Y from an interface substrate 104Y and the formed positional shear measuring pattern is transferred on a transfer conveyor belt 8 as a transfer image of a symbol 108Y. After the positional shear measuring pattern to be outputted from the interface substrate 104Y at the image forming device 105Y is sent to the image forming device 105Y and after a fixed time pertinent to a difference in distance of transfer points between the image forming devices 105Y and 105M, a positional shear measuring pattern to be outputted from an interface substrate 104M at the image forming device 105M is sent to the image forming device 105M.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The image-formation equipment which comes to have the system which carries out time sharing of said sensor, respectively, outputs it in image-formation equipment equipped with two or more sensors which detect the pattern of the system of multiplex image formation which carries out sequential imprint conveyance of the image formed in two or more image-formation sections on one record medium, and obtains a color picture, and the image on said record medium for location measurement, compounds the image measurement result by the sensor of ********, and distinguishes said pattern for image position measurement.
[Claim 2] Time sharing of an output of said sensor is image formation equipment according to claim 1 which becomes as a system performed to the conveyance direction of a form with which an image on said record medium is imprinted.
[Claim 3] Time sharing of an output of said sensor is image formation equipment according to claim 1 which comes to have a system performed for every pixel.
[Claim 4] The image-formation equipment which becomes as a system which detects said pattern for location measurement with one of outputs among the outputs in these image sensors in image-formation equipment equipped with a reading means detect the pattern of the system of multiplex image formation which carries out sequential imprint conveyance of the image formed in two or more image-formation sections on one record medium, and obtains a color picture, and the image on said record medium for location measurement while using said reading means as two image sensors.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the multiplex image formation equipment which is applied to image formation equipments, such as for example, a laser beam copying machine and a printer, especially has two or more image formation sections.
[0002]
[Description of the Prior Art] If the transfer picture location has shifted from the ideal location for every image formation section in case the sequential imprint of the image formed by two or more image formation sections is carried out to up to a record medium, a tint will be different, or it will become an image with a color gap, and good image quality will not be acquired.
[0003] On the other hand, there are some which aimed at improvement in image quality by using the sensor for image position detection as indicated by JP,63-271275,A and JP,1-281468,A. After this reads the image position measurement pattern on the imprint conveyance belt formed with each image formation equipment by the sensor for image position detection and calculates the amount of gaps of each color by the image position detection processing circuit, it obtains a good image with few color gaps by amending a part for the amount of gaps with each image formation equipment.
[0004]
[Problem(s) to be Solved by the Invention] However, it will not be avoided that the circuit magnitude of the thing which equips these official reports with two or more image reading means with the equipment of a publication, then an image reading means and an image position detection processing means is enlarged, but it will cause lifting of a product price.
[0005] For example, if it is the case where the sensor of an image reading means is used as an image sensor, there are the following failures.
[0006] Generally, since the image sensor has two or more outputs for high-speed actuation, a difference produces it in the output of two or more lines according to the difference of the linearity of the difference of an actuation wave of the output section, internal capacity coupling, and amplifier etc. In order to amend the difference of such an output and to make it a proper output value, it is required for each output to have an amplifying circuit and an offset equalization circuit, and at least this will become quite large-scale and expensive.
[0007] Furthermore, in a thing equipped with two or more image reading means, circuit magnitude will become large and only the number of image reading means will become still more expensive.
[0008] Moreover, the main parts which constitute electrophotography processes, such as a discharge device, a heating roller, a development counter, and a cleaner, are arranged around an image reading means. For this reason, the space of a layout is narrow and comes to be restricted, and an image position detection processing circuit adjoins an image reading means, and cannot be arranged in many cases. Therefore, although the configuration transmitted using a cable will be adopted, in a thing with two or more image reading means, two or more electrical transmission cables will also be needed, and circuit magnitude will become what also has large very expensive image position detection processing ****.
[0009] In multiplex image formation equipment, the technical problem which should be solved in this invention has the highly precise, small, and cheap image position reading section, and is to offer the image formation equipment which can form a good image with few color gaps.
[0010]
[Means for Solving the Problem] A system of multiplex image formation which this invention carries out sequential imprint conveyance of the image formed in two or more image formation sections on one record medium, and obtains a color picture, In image formation equipment equipped with two or more sensors which detect a pattern for location measurement of an image on said record medium, it is characterized by coming to have a system which carries out time sharing of said sensor, respectively, outputs it, compounds an image measurement result by sensor of ********, and distinguishes said pattern for image position measurement. Time sharing of an output of a sensor can be performed to the conveyance direction of a form with which an image on a record medium is imprinted, and it may be made to perform it for every pixel.
[0011] Furthermore, in image formation equipment equipped with a reading means to replace with a sensor and to detect a pattern for location measurement of an image, while using a reading means as two image sensors, it can also consider as a configuration which detects said pattern for location measurement with one of outputs among

outputs in these image sensors.
[0012]
[Function] By using two or more sensor outputs which detect the pattern for location measurement of an image by time sharing, gain, an offset equalization circuit, an A/D converter, a transmission medium, an image position detection processing circuit, etc. are sharable by two or more sensors.
[0013] Moreover, by using only a single-sided output among the odd number even number outputs of the image sensor used as a reading means, an image reading means can be constituted from conventional half circuit magnitude and a conventional half space, it is highly precise, cheap, and is small, and image formation equipment with the reliable image position reading section can be realized.
[0014]
[Example] Drawing 1 is the schematic diagram of the configuration of the image formation equipment in which one example of this invention is shown, and shows the color picture formation equipment of a multiplex imprint method as an example.
[0015] In drawing, image formation of the image of the manuscript 2 placed on the platen 1 is carried out to an image sensor 3 through a lens 16, it is read as an electrical signal, and is accumulated in the storage means of the image-processing section 4 temporarily.
[0016] From the image-processing section 4, the data of each color of Yellow Y, Magenta M, a cyan C, and Black K is outputted, an electrostatic latent image is formed in each photo conductor drum 6Y, 6M, 6C, and 6K with the laser beam scanners 5Y, 5M, 5C, and 5K of the image formation section, and it is further visible-image-ized by development counters 7Y, 7M, 7C, and 7K. At this time, it is the one image formation section which combined the laser beam scanners 5Y, 5M, 5C, and 5K, and in this example, it is equipment with which 5Y, 6Y, and 7Y form the color of yellow, and 5M, 6M, and 7M are equipment with which a Magenta, and 5C, 6C and 7C form a cyan, and 5K, 6K, and 7K form black, respectively similarly.
[0017] The form 11 which records the image of each [these] color is supplied from the form tray 12. The form 11 which came out of the tray 12 is sent in on the imprint conveyance belt 8 with the delivery roller 13 to predetermined timing. The imprint belt 8 is driven in the direction which sends out a form 11 to the blowdown tray 15 with the driving roller 9 connected with the motor (not shown) of the dedication excellent in fixed-speed nature. Moreover, the follower roller 10 is formed in a driving roller 9 and the side which counters, and it is supported so that a fixed tension may start the imprint conveyance belt 8.
[0018] The paper feed timing and image write-in timing are decided so that the head of the form 11 conveyed with the imprint conveyance belt 8 and the head of the image on first photo conductor drum 6Y formed by image formation equipment may be in agreement with the imprint point of the lowest point of photo conductor drum 6Y.
[0019] the visible image on photo conductor drum 6Y imprints the form 11 which reached the imprint point by the corotron for an imprint etc. — having — further — the imprint point and others just under photo conductor drum 6M — it carries out. The visible image on photo conductor drum 6M is imprinted the same with the form 11 which reached the imprint just under photo conductor drum 6M having been imprinted by photo conductor drum 6Y. Similarly, if the form 11 which finished C, K, and all imprints is further conveyed with the imprint conveyance belt 8 and it reaches to near the follower roller 10, a form 11 will exfoliate a form 11 from the imprint conveyance belt 8 by corotron, a stripper, etc. for exfoliating from the imprint conveyance belt 8. Then, it is established by the anchorage device 14 and discharged on the blowdown tray 15.
[0020] Drawing 2 is the schematic diagram of the color gap amendment system of the color picture formation equipment of a multiplex imprint method.
[0021] In drawing, 101 is a sensor which reads the pattern image for the image position measurement on image formation equipment 105Y and the 05 imprint conveyance belt 8 formed of M, 105C, and 105K. These sensors 101 are arranged to the ends of an image field in the example of a graphic display, respectively.
[0022] 102 is the light source which makes a background light required in order that a sensor 101 may read the image on the imprint conveyance belt 8, and makes securable quantity of light sufficient as the light source of a sensor 101 like LED, a halogen lamp, or a fluorescent lamp.
[0023] 104Y, 104M, 104C, and 104K are interface substrates which send a picture signal to the laser beam scanners 5Y, 5M, 5C, and 5K in image formation equipment, and 106 is a substrate which takes charge of an image position detection processor collectively. 109 is a substrate which takes charge of image-processing relation collectively in a memory list, and 107 is a control substrate which manages a motion of all these substrates and the whole equipment.
[0024] Next, the details of a color gap amendment system are explained.
[0025] Location gap amendment is performed by going into the amendment cycle of the dedication beforehand set as equipment. The object of this equipment amends color gap of each color which happens from the location gap and timing fluctuation of a minute drum by external force, a temperature change, etc. besides amendment of dispersion in components or an assembly. What is necessary is just to let the time of exceeding a constant rate with receipts and payments of imprint equipment after it follows, for example, a paper jam occurs, and the temperature change in equipment etc. be a start condition included in the amendment cycle of this equipment.
[0026] If it goes into an amendment cycle, a command will be taken out from the control substrate 107 by each substrates 104Y, 104M, 104C, 104K, and 106,109. The interface substrates 104Y, 104M, 104C, and 104K The role of the pattern generator which outputs the pattern for location gap measurement is played. A location gap measurement pattern is transmitted to the image formation equipments 105Y, 105M, 105C, and 105K, and the image

position detection processing substrate 106 makes the preparations which sample the pattern for location gap measurement outputted with the image formation equipments 105Y, 105M, 105C, and 105K. If an amendment cycle starts, the pattern for location gap measurement will be first transmitted to image formation equipment 105Y from interface substrate 104Y, and the pattern for location gap measurement formed by image formation equipment 105Y will be imprinted as an imprint image of sign 108Y of a graphic display on the imprint conveyance belt 8. After the pattern for location gap measurement outputted by interface substrate 104Y to image formation equipment 105Y is transmitted to image formation equipment 105Y, the pattern for location gap measurement outputted following fixed time amount applicable to the difference of the distance of the imprint point of the image formation equipments 105Y and 105M by interface substrate 104M to image formation equipment 105M is transmitted to image formation equipment 105M. Imprint image 108M are imprinted for the pattern for location gap measurement formed by image formation equipment 105M on the imprint conveyance belt 8. At this time, the pattern of imprint image 108M is the pattern with which overwrite of the pattern for location gap measurement further formed by image formation equipment 105M on imprint image 108Y already imprinted was carried out.

[0027] The pattern with which overwrite of the pattern for location gap measurement which similarly imprint image 108C was formed and was formed with all image formation equipments was carried out is completed by imprint image 108K on the imprint conveyance belt 8. In addition, the pattern for location gap measurement does not necessarily need to serve as overwrite.

[0028] Pattern imprint image 108K for location gap measurement completed are further conveyed with the imprint conveyance belt 8, and reach just under a sensor 101. and with the location gap amendment substrate 106 which carries out a sample, the image data from a sensor 101 It is acting as the monitor of at least one of the pattern output timing for location gap measurement of the interface substrates 104Y, 104M, 104C, and 104K. From the output timing of the at least one interface substrate The time amount which the pattern for location gap measurement reaches just under a sensor 101 From the gap between the image formation equipment which forms the pattern for location gap measurement beforehand outputted from the interface substrate, and a sensor 101 Although the sample of the pattern for location gap measurement is carried out, the need, sufficient sample initiation timing, and sample termination timing can be deduced.

[0029] If the image position detection processing substrate 106 becomes sample initiation timing, it will begin to incorporate the picture signal from a sensor 101 to high-speed memory, and if it becomes sample termination timing, it will finish incorporation.

[0030] Even before ending the sample of the pattern for location gap measurement which comes to a degree at the same time it finishes incorporation, from those incorporated data, for example with a method of elastic center etc., an image position is decided and it stores in main memory by making it for example, into the image position address. By repeating this actuation several times, the image position address which some decided for every image formation equipment is obtained. Here, in order to raise a settled image position address precision, the average is taken for the image position address which they some decided for every image formation equipment.

[0031] next, the correction value which amends the location gap between each image formation equipment with the algorithm beforehand decided in the image position detection processing substrate 106 from the image position address decided for every image formation equipment — some of every location gap amendment parameters — and it computes for every image formation equipment. With some location gap amendment parameters, there are a gap of the scan starting position of for example, a laser beam scanner, i.e., a gap of a main scanning direction, and the imprint conveyance direction of vertical scanning, i.e., the direction, a gap of a main scanning direction scale factor, a gap of the scale factor of the direction of vertical scanning, an angle gap to a main scanning direction, etc. Those computed correction value is set to the image formation equipments 105Y, 105M, 105C, and 105K, the interface substrates 104Y, 104M, and 104C, and 104K grade directly or indirectly from the image position detection processing substrate 106, and this amendment cycle is ended.

[0032] At the time of the color picture creation activity which is the original function of this image formation equipment, the good image which stopped the amount of color gaps between each image formation equipment to the minimum is obtained after this amendment cycle termination.

[0033] By the way, in order to suppress this color gap to the minimum, it is meaningless if that amount of gaps cannot be grasped by RE ** RU finer than the amount of allowance color gaps in the portion which detects that amount of gaps. Moreover, although maintenance nature, reliability, etc. as goods were taken into consideration, if it does not come out, the goods which a user can satisfy cannot be offered.

[0034] Then, the configuration of the detection section which can solve such a problem is explained.

[0035] The decomposition perspective diagram in which drawing 3 shows the structure of an image reading means concretely, and drawing 4 are drawings of longitudinal section of the important section when seeing in the direction of arrow head A of drawing 3 .

[0036] In drawing 3 , a case 200 shows the sensor 101 of drawing 2 concretely, was seen from the main part of equipment, equipped the near side with Studs 201a and 201b, and has formed Studs 202a and 202b in the back side. 203,204 is the frame of image formation equipment.

[0037] A case 200 inserts Studs 202a and 202b in the holes 203a and 203b of the frame 203 of a rear side, respectively, inserts Studs 201a and 201b in the holes 205a and 205b of a plate 205, binds a plate 205 tight on a front side frame with the screw 206 for immobilization further, and is fixed. The holes 203a and 203b of the rear frame 203 and the holes 204a and 204b of a front frame can be made with the size managed so that it might become within a value of standard with the alignment of the distance from the imprint conveyance belt 8, and both.

[0038] By such configuration, the case 200 is simply removable to the frame of image formation equipment, and, moreover, the physical relationship of the stud on an imprint belt and a case serves as the form where it is settled in a certain value of standard, then. Therefore, not to mention easy-izing of the maintenance after an assembly activity or installation, and compaction, even if the activity of exchange is by failure of a detecting element after installation, it can be coped with only by exchange of this case, and no tuning which starts troublesomely as for time amount is generated.
[0039] Drawing 5 is drawing of longitudinal section of the internal structure of the case 200 of the image reading means shown with the imprint conveyance belt 8, and drawing 6 is drawing showing the physical relationship of the toner image on the sensor substrate 211, the short focal lens array 212, and the imprint conveyance belt 8 in three dimensions.
[0040] In drawing, 210 is an image sensor and 211 is the substrate which carried the actuation circuit and circumference circuit of a sensor 210. Moreover, 212 is a short focal lens array and 218 is the substrate which carried the source 217 of the illumination light, and its circumference circuit.
[0041] Two pairs of the sensor substrate 211 and the short focal lens array 212 are arranged in on a case 200. By using two sensors, adjustment in all the directions of color gaps, such as an angle gap to a gap of a main scanning direction, a gap of the direction of vertical scanning, a scale-factor error, and a main scanning direction, is attained. For example, as long as it performs only adjustment of the direction of vertical scanning, one piece is sufficient, and as long as it uses a sensor for every color, to say nothing of being good, any number of number of sensors may use an area sensor like four pieces.
[0042] Furthermore, 213 is a member holding the short focal lens array 212, and can be adjusted in the vertical direction to a case 200. Moreover, the sensor substrate 211 can be adjusted to the stud 214 currently fixed to the case 200. By having such a device, the physical relationship of a sensor 210 and the short focal lens array 212 can be adjusted to arbitration on a case 200, and it becomes possible to attach in the precision of the request corresponding to a military requirement.
[0043] Here, in order to perform accurate image position detection, the case where CCD is used for a reading means is explained.
[0044] The configuration of CCD general to drawing 7 is shown.
[0045] As shown in drawing 7 , in order that a CCD line sensor may have the sensitization section, the transfer section, and the output section, may raise a degree of integration to the transfer section and may lessen transfer loss, it is equipped with the register of two trains. And a transfer of the signal charge of an odd number pixel and an even number pixel is taken charge of within n pixels, respectively, and it is taken out outside as an odd number output and an even number output via each output section.
[0046] However, a difference arises in the output of two lines according to the difference of the linearity of the difference of an actuation wave of the output section, internal capacity coupling, and amplifier etc. When carrying out high-speed actuation, an output difference will arise also by timing with the still more delicate sample hold at the time of analog processing.
[0047] In order to amend such an output difference and to make it a proper output value, it is necessary to have an amplifying circuit and an offset equalization circuit in each of odd number and even number, and two quantization circuits are also still more nearly required.
[0048] The block diagram of the digital disposal circuit of conventional CCD is shown in drawing 8 .
[0049] It doubles with the reference voltage at the time of there being gain and an offset equalization circuit and quantizing to the output of the odd number of CCD, and each even number. Gain and an offset equalization circuit, and four quantization circuits are required of the case of two or more CCD, for example, two CCD. if an offset equalization circuit is level which is not saturated in the case of quantization -- odd number or even number -- it may add only to output of either one of the two, a certain fixed value may be added or subtracted, and the relative difference of a parity may be amended.
[0050] moreover, an offset equalization circuit may be boiled as shown in the block diagram shown in drawing 9 , it may be added after quantization, and is possible also after composition of odd number or even number. And it is better to be able to carry out adjustable, since the correction value has dispersion by CCD.
[0051] The reading unit which used two or more conventional CCD for drawing 10 , and the block diagram of an image position detection processing circuit are shown.
[0052] In the image reading unit, the CCD-A substrate and the CCD-B substrate are built in, and it is attached in the travelling direction and the direction of a right angle of the imprint conveyance belt 8, respectively. The one where the gap is possible larger also considers and selects the effect of the dirt of the imprint conveyance belt 8, bending, curvature, an oscillation, etc., although the inclination detection precision of an image field becomes good. And CCD-A and CCD-B are adjusted so that it may be parallel on a fixture beforehand, the aforementioned digital disposal circuit is built in each, and gain and an offset equalization circuit, and four circuits of quantization circuits are built in.
[0053] Since a CCD driving signal needs to take two CCD and synchronizations, the same driving signal is sent to each CCD. Furthermore, as for the CLK, a synchronization is taken for CLK of a laser beam scanner, and frequency has become whether to be the integral multiple. Amendment will be made and recorded if only area respectively required for image memory B of image position detection processing circles needs the picture signal of read CCD-A for image memory A of image position detection processing circles as for the picture signal of CCD-B. Next, quantity of light nonuniformity amendment etc. is carried out by CPU, the relative amount of gaps of detection of

the difference of the image position of each color and the image position of CCD-A and CCD-B is detected, the image imprint location of each color is controlled by the image formation equipment controller, and the signal of image memory A and image memory B can obtain a good image without a color gap.
[0054] In this case, the inclination in an image field can be expressed with the difference delta of the center of gravity of the image imprinted by the form conveyance band from the image formation section at the time of the same as shown in drawing 11 .
[0055] On the other hand, the following color gaps are detected in this invention.
[0056] The case where two CCD is used is considered. The CCD sensor is attached in the travelling direction and the direction of a right angle of the imprint conveyance belt 8 for detecting the image inclination and scale-factor error in an image field. On the other hand, they are detectable even if it uses CCD-A and CCD-B by time sharing, as shown in drawing 13 .
[0057] That is, from the pattern gap X1 for location gap measurement read within the same CCD, if the scale factor of the form conveyance direction can be found, the pattern gap for location gap measurement of positive always between CCD-A and CCD-B can be known. And if the actual pattern gap X2 for location gap measurement between this pattern gap, CCD-A, and CCD-B and the difference of Xthree are taken, it can ask for the inclination in an image field.
[0058] In addition, it is desirable to take some averages of a place on the occasion of measurement. Moreover, what is necessary is just to compare a theoretical pattern gap with a actual value, if the scale factor of the form conveyance direction has not shifted.
[0059] By changing CCD-A and CCD-B by turns, and using them with the period of an image position measurement pattern, as shown in (a) of drawing 13 , (b), and (c), the gain and the offset equalization circuit which were 4 circuit need conventionally, and a quantization circuit can be reduced in two half circuits, as shown in drawing 12 . For this reason, it becomes reducible [an electrical part and spaces], and the number of interface signals with the image position detection processing section also becomes half. Therefore, the number of pins of a cable or a connector can be reduced, there can be little memory and it can end, and it becomes small, and a circuit cutback can be carried out and the data width of face of the image location detection processing section can also improve large reduction and the reliability of cost.
[0060] Moreover, if the general-purpose element which LSI-ized two circuits and a quantization composition circuit for gain and offset adjustment is used, spaces can be reduced more and reliability can be raised. It may be after quantization although time sharing of the signal is carried out immediately after the CCD output at drawing 12 . Moreover, in drawing 12 , although a CCD actuation circuit is on the image position detection processing section, it may be in an image reading unit.
[0061] Here, on the outskirts of a reading means of the image position measurement pattern on the imprint conveyance belt 8, the discharge devices electrification and the object for electric discharge of a photoconductor drum, an imprint, for form exfoliation, etc. are arranged, and these discharge by number 100- number 1000V. On the other hand, the sensor output signal level within a reading means is several 100mV and about [of those] 1/1000, and when transmitting a CCD analog output signal for a long time, if it transmits as it is, it will be influenced by the noise of a discharge device. Even if it amplifies to the input voltage level of an A/D converter, as compared with the voltage level of a peripheral device, it is dramatically small, and the effect of a noise may be received.
[0062] It may be better to transmit the data after quantization here, when between sensors is separated. It is effective to consider as the configuration of drawing 14 to such conditions.
[0063] That is, it connects by a flexible substrate or a flexible cable so that it can carry out adjustable [of the CCD-A section and the CCD-B section] independently, with parallelism maintained, and it adjusts according to an individual so that it may double with the optimal focus location of image reading.
[0064] In this case, although gain and an offset equalization circuit, and quantization composition circuits are irreducible, the cables from an image reading unit to the image position processing section can be reduced, and a cost cut can be aimed at. Moreover, the LSI-ized general-purpose element may be used for gain, and offset adjustment and a quantization composition circuit.
[0065] Furthermore, the method which compounds a CCD-A output and a CCD-B output for every [every area and] pixel like drawing 15 as the method of different time sharing, and is sent to an image position detecting element is also considered.
[0066] Although a video rate doubles by this method, it is an advantage that a CCD-A output and a CCD-B output are measured simultaneously, and the inclination in an image field can be detected. Therefore, the system with a late video rate is turned to. The synthetic method in the analog after gain and offset adjustment and the digital synthetic method can be considered like [this method] the above-mentioned time sharing.
[0067] Next, an image is explained about how to detect a readout color gap, among two or more outputs of a reading image sensor only using the output of which or one of the two.
[0068] Drawing 16 is a block diagram for this detection method.
[0069] The point made into the system which excluded the gain, the offset equalization circuit, the quantization circuit, and the synthetic circuit for a piece channel as compared with the block diagram of drawing 8 is different.
[0070] As drawing 7 explained, the signal output of CCD is taken out to another **** exterior by two, an odd number output and an even number output. However, a difference arises in the output of two lines according to the difference of the difference of an actuation wave of the output section, internal capacity coupling, and the linearity of amplifier etc. In order to amend this and to make it a proper output value, it needed to have an amplifying circuit

and an offset equalization circuit in each of odd number and even number, and two quantization circuits were also still more nearly required. Although there are some in which odd-number even number had the output compounded inside depending on CCD, if it is unchanging for there being an output difference of odd-number even number after all and lets the same gain and an offset equalization circuit pass, an odd-number even-number output difference remains existing, and even if it carries out a digital shading compensation and dark amendment, in an error's arising at the time of image position detection, the speed required of a video-processing circuit will also double. Moreover, it is [pixel size is large or / few pixels] or is expensive although there are also the single transfer section and CCD with a single output.

[0071] On the other hand, even if it uses general-purpose CCD with a configuration like this example, since it passes along a common circuit, a difference cannot arise, and the speed of a video-processing circuit of all outputs is also good in the one half at the time of a synthetic output. although it will use thinning out the effective pixel of CCD, since the read magnitude of 1 pixel does not change — image position data — right and left — if uniform distribution is carried out, the same result as the case where a pixel is not thinned out will be obtained. moreover, image position data — right and left — even if it is uneven distribution, by using image position detection algorithms, such as a method of elastic center, etc., the almost same result as the case where a pixel is not thinned out is obtained, and 1 pixel is the error which can be disregarded to the control step of a light beam scanner if quite small.

[0072] Moreover, image position detection precision can improve further by making [many] the number of the data contained in the read image. That is, precision improves by making reading pixel size of a sensor small, raising resolution or making width of face of a reading image thick. For example, what is necessary is just to operate only the piece channel using the sensor of 7um(s) which are the pixel sizes of the one half, if you want to read image position data in the precision of 14um. In this case, when the pixel size of CCD became small, sensitivity falls, but since the resolution of a short focal lens array cannot be followed even if the resolution of CCD becomes not much small, a reset signal is thinned out to usual one half, and there is also a method of using by doubling light exposure. In addition, deterioration of resolution is not produced in the direction of vertical scanning.

[0073] The above thing is mentioned at drawing 17 and an example is shown.

[0074] If the result when being with the time of there being no infanticide of an effective pixel in the case of image position data with symmetrical distribution as shown in this drawing (a) becomes completely the same and it asks for the address of the center of gravity of an image position with a method of elastic center, a center of gravity will serve as a location of the address 5.

[0075] on the other hand, (b) of this drawing — like — right and left — in the case of image position data with unsymmetrical distribution If it asks for the address of the center of gravity of an image position to triple figures below decimal point with a method of elastic center The center-of-gravity address when the center-of-gravity address when you have no infanticide being set to 5.273, and being [thin out and] is 5.214, and when it is set to 0.059 and the sensor of 14um pixel size is used, the difference is an error of 0.8261um and 1 um or less, and is the value which can be disregarded.

[0076] Next, how to carry out the instrumental scan of the reading means in the form conveyance direction and the direction of a right angle is explained.

[0077] The same engine performance as the case where it has two or more image reading means can be obtained by replacing with using two or more image reading means by time sharing, making the instrumental scan of the one image reading means carry out in the form conveyance direction and the direction of a right angle, and making it move to a required image reading location.

[0078] For example, what is necessary is just to make it say that CCD-A is moved to the location which should have CCD-B, and (b) section of the pattern for location gap measurement is made to read, and it makes (c) section of return and the pattern for location gap measurement read to the location of CCD-A in drawing 13 , after reading (a) section of the pattern for location gap measurement by CCD-A. Under the present circumstances, what is necessary is just to make the output gap (X2) of the pattern for location gap measurement, and (X3) larger than the time amount by which CCD-A moves, and is stood still and stabilized to the location which should have CCD-B.

[0079] In addition, although this example explained the configuration in the transmitted illumination mold by transparent imprint belt material, if belt material is opaque, the same effect can be acquired by considering as the form where the lighting lamp was also incorporated on the case.

[0080]

[Effect of the Invention] In this invention, it can consider as the configuration which shared a circuit, a transmission medium, etc. about a sensor by using two or more sensor outputs which detect the pattern for location measurement of an image by time sharing. Therefore, it becomes reducible [simplification of equipment, and cost] by few components and the simple circuit.

[0081] Moreover, an image reading means can consist of conventional half circuit magnitude and spaces by using only a single-sided output among the odd number even number outputs of the image sensor used as a reading means. Therefore, it is small, location reading of a high image also of precision becomes possible, and compacter image formation equipment can be offered.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Industrial Application] This invention relates to the multiplex image formation equipment which is applied to image formation equipments, such as for example, a laser beam copying machine and a printer, especially has two or more image formation sections.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art] If the transfer picture location has shifted from the ideal location for every image formation section in case the sequential imprint of the image formed by two or more image formation sections is carried out to up to a record medium, a tint will be different, or it will become an image with a color gap, and good image quality will not be acquired.
[0003] On the other hand, there are some which aimed at improvement in image quality by using the sensor for image position detection as indicated by JP,63-271275,A and JP,1-281468,A. After this reads the image position measurement pattern on the imprint conveyance belt formed with each image formation equipment by the sensor for image position detection and calculates the amount of gaps of each color by the image position detection processing circuit, it obtains a good image with few color gaps by amending a part for the amount of gaps with each image formation equipment.

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EFFECT OF THE INVENTION

[Effect of the Invention] In this invention, it can consider as the configuration which shared a circuit, a transmission medium, etc. about a sensor by using two or more sensor outputs which detect the pattern for location measurement of an image by time sharing. Therefore, it becomes reducible [simplification of equipment, and cost] by few components and the simple circuit.
[0081] Moreover, an image reading means can consist of conventional half circuit magnitude and spaces by using only a single-sided output among the odd number even number outputs of the image sensor used as a reading means. Therefore, it is small, location reading of a high image also of precision becomes possible, and compacter image formation equipment can be offered.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, it will not be avoided that the circuit magnitude of the thing which equips these official reports with two or more image reading means with the equipment of a publication, then an image reading means and an image position detection processing means is enlarged, but it will cause lifting of a product price.

[0005] For example, if it is the case where the sensor of an image reading means is used as an image sensor, there are the following failures.

[0006] Generally, since the image sensor has two or more outputs for high-speed actuation, a difference produces it in the output of two or more lines according to the difference of the linearity of the difference of an actuation wave of the output section, internal capacity coupling, and amplifier etc. In order to amend the difference of such an output and to make it a proper output value, it is required for each output to have an amplifying circuit and an offset equalization circuit, and at least this will become quite large-scale and expensive.

[0007] Furthermore, in a thing equipped with two or more image reading means, circuit magnitude will become large and only the number of image reading means will become still more expensive.

[0008] Moreover, the main parts which constitute electrophotography processes, such as a discharge device, a heating roller, a development counter, and a cleaner, are arranged around an image reading means. For this reason, the space of a layout is narrow and comes to be restricted, and an image position detection processing circuit adjoins an image reading means, and cannot be arranged in many cases. Therefore, although the configuration transmitted using a cable will be adopted, in a thing with two or more image reading means, two or more electrical transmission cables will also be needed, and circuit magnitude will become what also has large very expensive image position detection processing ****.

[0009] In multiplex image formation equipment, the technical problem which should be solved in this invention has the highly precise, small, and cheap image position reading section, and is to offer the image formation equipment which can form a good image with few color gaps.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] A system of multiplex image formation which this invention carries out sequential imprint conveyance of the image formed in two or more image formation sections on one record medium, and obtains a color picture, In image formation equipment equipped with two or more sensors which detect a pattern for location measurement of an image on said record medium, it is characterized by coming to have a system which carries out time sharing of said sensor, respectively, outputs it, compounds an image measurement result by sensor of ********, and distinguishes said pattern for image position measurement. Time sharing of an output of a sensor can be performed to the conveyance direction of a form with which an image on a record medium is imprinted, and it may be made to perform it for every pixel.
[0011] Furthermore, in image formation equipment equipped with a reading means to replace with a sensor and to detect a pattern for location measurement of an image, while using a reading means as two image sensors, it can also consider as a configuration which detects said pattern for location measurement with one of outputs among outputs in these image sensors.

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OPERATION

[Function] By using two or more sensor outputs which detect the pattern for location measurement of an image by time sharing, gain, an offset equalization circuit, an A/D converter, a transmission medium, an image position detection processing circuit, etc. are sharable by two or more sensors.
[0013] Moreover, by using only a single-sided output among the odd number even number outputs of the image sensor used as a reading means, an image reading means can be constituted from conventional half circuit magnitude and a conventional half space, it is highly precise, cheap, and is small, and image formation equipment with the reliable image position reading section can be realized.

[Translation done.]

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EXAMPLE

[Example] Drawing 1 is the schematic diagram of the configuration of the image formation equipment in which one example of this invention is shown, and shows the color picture formation equipment of a multiplex imprint method as an example.
[0015] In drawing, image formation of the image of the manuscript 2 placed on the platen 1 is carried out to an image sensor 3 through a lens 16, it is read as an electrical signal, and is accumulated in the storage means of the image-processing section 4 temporarily.
[0016] From the image-processing section 4, the data of each color of Yellow Y, Magenta M, a cyan C, and Black K is outputted, an electrostatic latent image is formed in each photo conductor drum 6Y, 6M, 6C, and 6K with the laser beam scanners 5Y, 5M, 5C, and 5K of the image formation section, and it is further visible-image-ized by development counters 7Y, 7M, 7C, and 7K. At this time, it is the one image formation section which combined the laser beam scanners 5Y, 5M, 5C, and 5K, and in this example, it is equipment with which 5Y, 6Y, and 7Y form the color of yellow, and 5M, 6M, and 7M are equipment with which a Magenta, and 5C, 6C and 7C form a cyan, and 5K, 6K, and 7K form black, respectively similarly.
[0017] The form 11 which records the image of each [these] color is supplied from the form tray 12. The form 11 which came out of the tray 12 is sent in on the imprint conveyance belt 8 with the delivery roller 13 to predetermined timing. The imprint belt 8 is driven in the direction which sends out a form 11 to the blowdown tray 15 with the driving roller 9 connected with the motor (not shown) of the dedication excellent in fixed-speed nature. Moreover, the follower roller 10 is formed in a driving roller 9 and the side which counters, and it is supported so that a fixed tension may start the imprint conveyance belt 8.
[0018] The paper feed timing and image write-in timing are decided so that the head of the form 11 conveyed with the imprint conveyance belt 8 and the head of the image on first photo conductor drum 6Y formed by image formation equipment may be in agreement with the imprint point of the lowest point of photo conductor drum 6Y.
[0019] the visible image on photo conductor drum 6Y imprints the form 11 which reached the imprint point by the corotron for an imprint etc. -- having -- further -- the imprint point and others just under photo conductor drum 6M -- it carries out. The visible image on photo conductor drum 6M is imprinted the same with the form 11 which reached the imprint just under photo conductor drum 6M having been imprinted by photo conductor drum 6Y. Similarly, if the form 11 which finished C, K, and all imprints is further conveyed with the imprint conveyance belt 8 and it reaches to near the follower roller 10, a form 11 will exfoliate a form 11 from the imprint conveyance belt 8 by corotron, a stripper, etc. for exfoliating from the imprint conveyance belt 8. Then, it is established by the anchorage device 14 and discharged on the blowdown tray 15.
[0020] Drawing 2 is the schematic diagram of the color gap amendment system of the color picture formation equipment of a multiplex imprint method.
[0021] In drawing, 101 is a sensor which reads the pattern image for the image position measurement on image formation equipment 105Y and the 05 imprint conveyance belt 8 formed of M, 105C, and 105K. These sensors 101 are arranged to the ends of an image field in the example of a graphic display, respectively.
[0022] 102 is the light source which makes a background light required in order that a sensor 101 may read the image on the imprint conveyance belt 8, and makes securable quantity of light sufficient as the light source of a sensor 101 like LED, a halogen lamp, or a fluorescent lamp.
[0023] 104Y, 104M, 104C, and 104K are interface substrates which send a picture signal to the laser beam scanners 5Y, 5M, 5C, and 5K in image formation equipment, and 106 is a substrate which takes charge of an image position detection processor collectively. 109 is a substrate which takes charge of image-processing relation collectively in a memory list, and 107 is a control substrate which manages a motion of all these substrates and the whole equipment.
[0024] Next, the details of a color gap amendment system are explained.
[0025] Location gap amendment is performed by going into the amendment cycle of the dedication beforehand set as equipment. The object of this equipment amends color gap of each color which happens from the location gap and timing fluctuation of a minute drum by external force, a temperature change, etc. besides amendment of dispersion in components or an assembly. What is necessary is just to let the time of exceeding a constant rate with receipts and payments of imprint equipment after it follows, for example, a paper jam occurs, and the temperature change in equipment etc. be a start condition included in the amendment cycle of this equipment.
[0026] If it goes into an amendment cycle, a command will be taken out from the control substrate 107 by each substrates 104Y, 104M, 104C, 104K, and 106,109. The interface substrates 104Y, 104M, 104C, and 104K The role of

the pattern generator which outputs the pattern for location gap measurement is played. A location gap measurement pattern is transmitted to the image formation equipments 105Y, 105M, 105C, and 105K, and the image position detection processing substrate 106 makes the preparations which sample the pattern for location gap measurement outputted with the image formation equipments 105Y, 105M, 105C, and 105K. If an amendment cycle starts, the pattern for location gap measurement will be first transmitted to image formation equipment 105Y from interface substrate 104Y, and the pattern for location gap measurement formed by image formation equipment 105Y will be imprinted as an imprint image of sign 108Y of a graphic display on the imprint conveyance belt 8. After the pattern for location gap measurement outputted by interface substrate 104Y to image formation equipment 105Y is transmitted to image formation equipment 105Y, the pattern for location gap measurement outputted following fixed time amount applicable to the difference of the distance of the imprint point of the image formation equipments 105Y and 105M by interface substrate 104M to image formation equipment 105M is transmitted to image formation equipment 105M. Imprint image 108M are imprinted for the pattern for location gap measurement formed by image formation equipment 105M on the imprint conveyance belt 8. At this time, the pattern of imprint image 108M is the pattern with which overwrite of the pattern for location gap measurement further formed by image formation equipment 105M on imprint image 108Y already imprinted was carried out.

[0027] The pattern with which overwrite of the pattern for location gap measurement which similarly imprint image 108C was formed and was formed with all image formation equipments was carried out is completed by imprint image 108K on the imprint conveyance belt 8. In addition, the pattern for location gap measurement does not necessarily need to serve as overwrite.

[0028] Pattern imprint image 108K for location gap measurement completed are further conveyed with the imprint conveyance belt 8, and reach just under a sensor 101. and with the location gap amendment substrate 106 which carries out a sample, the image data from a sensor 101 It is acting as the monitor of at least one of the pattern output timing for location gap measurement of the interface substrates 104Y, 104M, 104C, and 104K. From the output timing of the at least one interface substrate The time amount which the pattern for location gap measurement reaches just under a sensor 101 From the gap between the image formation equipment which forms the pattern for location gap measurement beforehand outputted from the interface substrate, and a sensor 101 Although the sample of the pattern for location gap measurement is carried out, the need, sufficient sample initiation timing, and sample termination timing can be deduced.

[0029] If the image position detection processing substrate 106 becomes sample initiation timing, it will begin to incorporate the picture signal from a sensor 101 to high-speed memory, and if it becomes sample termination timing, it will finish incorporation.

[0030] Even before ending the sample of the pattern for location gap measurement which comes to a degree at the same time it finishes incorporation, from those incorporated data, for example with a method of elastic center etc., an image position is decided and it stores in main memory by making it for example, into the image position address. By repeating this actuation several times, the image position address which some decided for every image formation equipment is obtained. Here, in order to raise a settled image position address precision, the average is taken for the image position address which they some decided for every image formation equipment.

[0031] next, the correction value which amends the location gap between each image formation equipment with the algorithm beforehand decided in the image position detection processing substrate 106 from the image position address decided for every image formation equipment — some of every location gap amendment parameters — and it computes for every image formation equipment. With some location gap amendment parameters, there are a gap of the scan starting position of for example, a laser beam scanner, i.e., a gap of a main scanning direction, and the imprint conveyance direction of vertical scanning, i.e., the direction, a gap of a main scanning direction scale factor, a gap of the scale factor of the direction of vertical scanning, an angle gap to a main scanning direction, etc. Those computed correction value is set to the image formation equipments 105Y, 105M, 105C, and 105K, the interface substrates 104Y, 104M, and 104C, and 104K grade directly or indirectly from the image position detection processing substrate 106, and this amendment cycle is ended.

[0032] At the time of the color picture creation activity which is the original function of this image formation equipment, the good image which stopped the amount of color gaps between each image formation equipment to the minimum is obtained after this amendment cycle termination.

[0033] By the way, in order to suppress this color gap to the minimum, it is meaningless if that amount of gaps cannot be grasped by RE ** RU finer than the amount of allowance color gaps in the portion which detects that amount of gaps. Moreover, although maintenance nature, reliability, etc. as goods were taken into consideration, if it does not come out, the goods which a user can satisfy cannot be offered.

[0034] Then, the configuration of the detection section which can solve such a problem is explained.

[0035] The decomposition perspective diagram in which drawing 3 shows the structure of an image reading means concretely, and drawing 4 are drawings of longitudinal section of the important section when seeing in the direction of arrow head A of drawing 3 .

[0036] In drawing 3 , a case 200 shows the sensor 101 of drawing 2 concretely, was seen from the main part of equipment, equipped the near side with Studs 201a and 201b, and has formed Studs 202a and 202b in the back side. 203,204 is the frame of image formation equipment.

[0037] A case 200 inserts Studs 202a and 202b in the holes 203a and 203b of the frame 203 of a rear side, respectively, inserts Studs 201a and 201b in the holes 205a and 205b of a plate 205, binds a plate 205 tight on a front side frame with the screw 206 for immobilization further, and is fixed. The holes 203a and 203b of the rear

frame 203 and the holes 204a and 204b of a front frame can be made with the size managed so that it might become within a value of standard with the alignment of the distance from the imprint conveyance belt 8, and both.
[0038] By such configuration, the case 200 is simply removable to the frame of image formation equipment, and, moreover, the physical relationship of the stud on an imprint belt and a case serves as the form where it is settled in a certain value of standard; then. Therefore, not to mention easy-izing of the maintenance after an assembly activity or installation, and compaction, even if the activity of exchange is by failure of a detecting element after installation, it can be coped with only by exchange of this case, and no tuning which starts troublesomely as for time amount is generated.
[0039] Drawing 5 is drawing of longitudinal section of the internal structure of the case 200 of the image reading means shown with the imprint conveyance belt 8, and drawing 6 is drawing showing the physical relationship of the toner image on the sensor substrate 211, the short focal lens array 212, and the imprint conveyance belt 8 in three dimensions.
[0040] In drawing, 210 is an image sensor and 211 is the substrate which carried the actuation circuit and circumference circuit of a sensor 210. Moreover, 212 is a short focal lens array and 218 is the substrate which carried the source 217 of the illumination light, and its circumference circuit.
[0041] Two pairs of the sensor substrate 211 and the short focal lens array 212 are arranged in on a case 200. By using two sensors, adjustment in all the directions of color gaps, such as an angle gap to a gap of a main scanning direction, a gap of the direction of vertical scanning, a scale-factor error, and a main scanning direction, is attained. For example, as long as it performs only adjustment of the direction of vertical scanning, one piece is sufficient, and as long as it uses a sensor for every color, to say nothing of being good, any number of number of sensors may use an area sensor like four pieces.
[0042] Furthermore, 213 is a member holding the short focal lens array 212, and can be adjusted in the vertical direction to a case 200. Moreover, the sensor substrate 211 can be adjusted to the stud 214 currently fixed to the case 200. By having such a device, the physical relationship of a sensor 210 and the short focal lens array 212 can be adjusted to arbitration on a case 200, and it becomes possible to attach in the precision of the request corresponding to a military requirement.
[0043] Here, in order to perform accurate image position detection, the case where CCD is used for a reading means is explained.
[0044] The configuration of CCD general to drawing 7 is shown.
[0045] As shown in drawing 7 , in order that a CCD line sensor may have the sensitization section, the transfer section, and the output section, may raise a degree of integration to the transfer section and may lessen transfer loss, it is equipped with the register of two trains. And a transfer of the signal charge of an odd number pixel and an even number pixel is taken charge of within n pixels, respectively, and it is taken out outside as an odd number output and an even number output via each output section.
[0046] However, a difference arises in the output of two lines according to the difference of the linearity of the difference of an actuation wave of the output section, internal capacity coupling, and amplifier etc. When carrying out high-speed actuation, an output difference will arise also by timing with the still more delicate sample hold at the time of analog processing.
[0047] In order to amend such an output difference and to make it a proper output value, it is necessary to have an amplifying circuit and an offset equalization circuit in each of odd number and even number, and two quantization circuits are also still more nearly required.
[0048] The block diagram of the digital disposal circuit of conventional CCD is shown in drawing 8 .
[0049] It doubles with the reference voltage at the time of there being gain and an offset equalization circuit and quantizing to the output of the odd number of CCD, and each even number. Gain and an offset equalization circuit, and four quantization circuits are required of the case of two or more CCD, for example, two CCD. if an offset equalization circuit is level which is not saturated in the case of quantization — odd number or even number — it may add only to output of either one of the two, a certain fixed value may be added or subtracted, and the relative difference of a parity may be amended.
[0050] moreover, an offset equalization circuit may be boiled as shown in the block diagram shown in drawing 9 , it may be added after quantization, and is possible also after composition of odd number or even number. And it is better to be able to carry out adjustable, since the correction value has dispersion by CCD.
[0051] The reading unit which used two or more conventional CCD for drawing 10 , and the block diagram of an image position detection processing circuit are shown.
[0052] In the image reading unit, the CCD-A substrate and the CCD-B substrate are built in, and it is attached in the travelling direction and the direction of a right angle of the imprint conveyance belt 8, respectively. The one where the gap is possible larger also considers and selects the effect of the dirt of the imprint conveyance belt 8, bending, curvature, an oscillation, etc., although the inclination detection precision of an image field becomes good. And CCD-A and CCD-B are adjusted so that it may be parallel on a fixture beforehand, the aforementioned digital disposal circuit is built in each, and gain and an offset equalization circuit, and four circuits of quantization circuits are built in.
[0053] Since a CCD driving signal needs to take two CCD and synchronizations, the same driving signal is sent to each CCD. Furthermore, as for the CLK, a synchronization is taken for CLK of a laser beam scanner, and frequency has become whether to be the integral multiple. Amendment will be made and recorded if only area respectively required for image memory B of image position detection processing circles needs the picture signal of read CCD-A

for image memory A of image position detection processing circles as for the picture signal of CCD-B. Next, quantity of light nonuniformity amendment etc. is carried out by CPU, the relative amount of gaps of detection of the difference of the image position of each color and the image position of CCD-A and CCD-B is detected, the image imprint location of each color is controlled by the image formation equipment controller, and the signal of image memory A and image memory B can obtain a good image without a color gap.
[0054] In this case, the inclination in an image field can be expressed with the difference delta of the center of gravity of the image imprinted by the form conveyance band from the image formation section at the time of the same as shown in drawing 11 .
[0055] On the other hand, the following color gaps are detected in this invention.
[0056] The case where two CCD is used is considered. The CCD sensor is attached in the travelling direction and the direction of a right angle of the imprint conveyance belt 8 for detecting the image inclination and scale-factor error in an image field. On the other hand, they are detectable even if it uses CCD-A and CCD-B by time sharing, as shown in drawing 13 .
[0057] That is, from the pattern gap X1 for location gap measurement read within the same CCD, if the scale factor of the form conveyance direction can be found, the pattern gap for location gap measurement of positive always between CCD-A and CCD-B can be known. And if the actual pattern gap X2 for location gap measurement between this pattern gap, CCD-A, and CCD-B and the difference of Xthree are taken, it can ask for the inclination in an image field.
[0058] In addition, it is desirable to take some averages of a place on the occasion of measurement. Moreover, what is necessary is just to compare a theoretical pattern gap with a actual value, if the scale factor of the form conveyance direction has not shifted.
[0059] By changing CCD-A and CCD-B by turns, and using them with the period of an image position measurement pattern, as shown in (a) of drawing 13 , (b), and (c), the gain and the offset equalization circuit which were 4 circuit need conventionally, and a quantization circuit can be reduced in two half circuits, as shown in drawing 12 . For this reason, it becomes reducible [an electrical part and spaces], and the number of interface signals with the image position detection processing section also becomes half. Therefore, the number of pins of a cable or a connector can be reduced, there can be little memory and it can end, and it becomes small, and a circuit cutback can be carried out and the data width of face of the image location detection processing section can also improve large reduction and the reliability of cost.
[0060] Moreover, if the general-purpose element which LSI-ized two circuits and a quantization composition circuit for gain and offset adjustment is used, spaces can be reduced more and reliability can be raised. It may be after quantization although time sharing of the signal is carried out immediately after the CCD output at drawing 12 . Moreover, in drawing 12 , although a CCD actuation circuit is on the image position detection processing section, it may be in an image reading unit.
[0061] Here, on the outskirts of a reading means of the image position measurement pattern on the imprint conveyance belt 8, the discharge devices electrification and the object for electric discharge of a photoconductor drum, an imprint, for form exfoliation, etc. are arranged, and these discharge by number 100- number 1000V. On the other hand, the sensor output signal level within a reading means is several 100mV and about [of those] 1/1000, and when transmitting a CCD analog output signal for a long time, if it transmits as it is, it will be influenced by the noise of a discharge device. Even if it amplifies to the input voltage level of an A/D converter, as compared with the voltage level of a peripheral device, it is dramatically small, and the effect of a noise may be received.
[0062] It may be better to transmit the data after quantization here, when between sensors is separated. It is effective to consider as the configuration of drawing 14 to such conditions.
[0063] That is, it connects by a flexible substrate or a flexible cable so that it can carry out adjustable [of the CCD-A section and the CCD-B section] independently, with parallelism maintained, and it adjusts according to an individual so that it may double with the optimal focus location of image reading.
[0064] In this case, although gain and an offset equalization circuit, and quantization composition circuits are irreducible, the cables from an image reading unit to the image position processing section can be reduced, and a cost cut can be aimed at. Moreover, the LSI-ized general-purpose element may be used for gain, and offset adjustment and a quantization composition circuit.
[0065] Furthermore, the method which compounds a CCD-A output and a CCD-B output for every [every area and] pixel like drawing 15 as the method of different time sharing, and is sent to an image position detecting element is also considered.
[0066] Although a video rate doubles by this method, it is an advantage that a CCD-A output and a CCD-B output are measured simultaneously, and the inclination in an image field can be detected. Therefore, the system with a late video rate is turned to. The synthetic method in the analog after gain and offset adjustment and the digital synthetic method can be considered like [this method] the above-mentioned time sharing.
[0067] Next, an image is explained about how to detect a readout color gap, among two or more outputs of a reading image sensor only using the output of which or one of the two.
[0068] Drawing 16 is a block diagram for this detection method.
[0069] The point made into the system which excluded the gain, the offset equalization circuit, the quantization circuit, and the synthetic circuit for a piece channel as compared with the block diagram of drawing 8 is different.
[0070] As drawing 7 explained, the signal output of CCD is taken out to another **** exterior by two, an odd number output and an even number output. However, a difference arises in the output of two lines according to the

difference of the difference of an actuation wave of the output section, internal capacity coupling, and the linearity of amplifier etc. In order to amend this and to make it a proper output value, it needed to have an amplifying circuit and an offset equalization circuit in each of odd number and even number, and two quantization circuits were also still more nearly required. Although there are some in which odd-number even number had the output compounded inside depending on CCD, if it is unchanging for there being an output difference of odd-number even number after all and lets the same gain and an offset equalization circuit pass, an odd-number even-number output difference remains existing, and even if it carries out a digital shading compensation and dark amendment, in an error's arising at the time of image position detection, the speed required of a video-processing circuit will also double. Moreover, it is [pixel size is large or / few pixels] or is expensive although there are also the single transfer section and CCD with a single output.

[0071] On the other hand, even if it uses general-purpose CCD with a configuration like this example, since it passes along a common circuit, a difference cannot arise, and the speed of a video-processing circuit of all outputs is also good in the one half at the time of a synthetic output. although it will use thinning out the effective pixel of CCD, since the read magnitude of 1 pixel does not change -- image position data -- right and left -- if uniform distribution is carried out, the same result as the case where a pixel is not thinned out will be obtained. moreover, image position data -- right and left -- even if it is uneven distribution, by using image position detection algorithms, such as a method of elastic center, etc., the almost same result as the case where a pixel is not thinned out is obtained, and 1 pixel is the error which can be disregarded to the control step of a light beam scanner if quite small.

[0072] Moreover, image position detection precision can improve further by making [many] the number of the data contained in the read image. That is, precision improves by making reading pixel size of a sensor small, raising resolution or making width of face of a reading image thick. For example, what is necessary is just to operate only the piece channel using the sensor of 7um(s) which are the pixel sizes of the one half, if you want to read image position data in the precision of 14um. In this case, when the pixel size of CCD became small, sensitivity falls, but since the resolution of a short focal lens array cannot be followed even if the resolution of CCD becomes not much small, a reset signal is thinned out to usual one half, and there is also a method of using by doubling light exposure. In addition, deterioration of resolution is not produced in the direction of vertical scanning.

[0073] The above thing is mentioned at drawing 17 and an example is shown.

[0074] If the result when being with the time of there being no infanticide of an effective pixel in the case of image position data with symmetrical distribution as shown in this drawing (a) becomes completely the same and it asks for the address of the center of gravity of an image position with a method of elastic center, a center of gravity will serve as a location of the address 5.

[0075] on the other hand, (b) of this drawing -- like -- right and left -- in the case of image position data with unsymmetrical distribution If it asks for the address of the center of gravity of an image position to triple figures below decimal point with a method of elastic center The center-of-gravity address when the center-of-gravity address when you have no infanticide being set to 5.273, and being [thin out and] is 5.214, and when it is set to 0.059 and the sensor of 14um pixel size is used, the difference is an error of 0.8261um and 1 um or less, and is the value which can be disregarded.

[0076] Next, how to carry out the instrumental scan of the reading means in the form conveyance direction and the direction of a right angle is explained.

[0077] The same engine performance as the case where it has two or more image reading means can be obtained by replacing with using two or more image reading means by time sharing, making the instrumental scan of the one image reading means carry out in the form conveyance direction and the direction of a right angle, and making it move to a required image reading location.

[0078] For example, what is necessary is just to make it say that CCD-A is moved to the location which should have CCD-B, and (b) section of the pattern for location gap measurement is made to read, and it makes (c) section of return and the pattern for location gap measurement read to the location of CCD-A in drawing 13 , after reading (a) section of the pattern for location gap measurement by CCD-A. Under the present circumstances, what is necessary is just to make the output gap (X2) of the pattern for location gap measurement, and (X3) larger than the time amount by which CCD-A moves, and is stood still and stabilized to the location which should have CCD-B.

[0079] In addition, although this example explained the configuration in the transmitted illumination mold by transparent imprint belt material, if belt material is opaque, the same effect can be acquired by considering as the form where the lighting lamp was also incorporated on the case.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

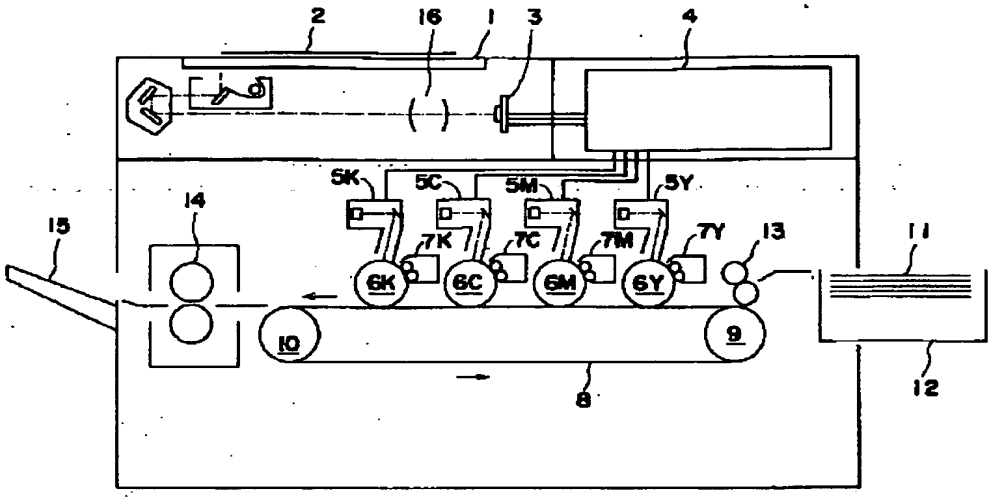
[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram showing one example of the image formation equipment of this invention.
[Drawing 2] It is the schematic diagram of the color gap amendment system of the color picture formation equipment of a multiplex imprint method.
[Drawing 3] It is the decomposition perspective diagram of an important section showing the concrete example of a configuration of the detection section of drawing 2 .
[Drawing 4] It is drawing of longitudinal section of an important section seen in the direction of arrow head A of drawing 3 .
[Drawing 5] It is drawing of longitudinal section of the reading unit shown with an imprint conveyance belt.
[Drawing 6] It is an outline perspective diagram for explaining the physical relationship of the toner image on the sensor substrate dedicated into a case, a short focal lens array, and an imprint belt.
[Drawing 7] It is drawing showing the general configuration of CCD.
[Drawing 8] It is the block diagram of the digital disposal circuit of conventional CCD.
[Drawing 9] It is the block diagram of the digital disposal circuit equipped with the offset equalization circuit.
[Drawing 10] It is the block diagram of an image position processing circuit using two or more conventional CCD.
[Drawing 11] It is drawing of the conventional example showing the point of detection of the image position by the reading means.
[Drawing 12] It is the block diagram of the image position processing circuit in this invention.
[Drawing 13] It is drawing showing the point of image position detection of the reading means in this invention.
[Drawing 14] It is the block diagram showing another example of the image position processing circuit in this invention.
[Drawing 15] It is drawing showing an example of the pattern of time sharing.
[Drawing 16] It is a block diagram to show how to detect a color gap only using one of the two of an image sensor.
[Drawing 17] It is drawing showing the example of the pattern of distribution of image position data.
[Description of Notations]
1: A platen, 2: A manuscript, 3: An image sensor, 4: The image-processing section, 5Y, 5M and 5C, 5K: A laser beam scanner, 6Y, 6M and 6C, 6K: A photo conductor drum, 7Y, 7M and 7C, 7K: A development counter, 8: An imprint conveyance belt, 9: A driving roller, 10: A follower roller, 11: A form, 12: A form tray, 14: An anchorage device, 15: A blowdown tray, 101: A sensor, 102: The light source, 104Y, 104M and 104C, 104K: An interface substrate, 105Y, 105M and 105C, 105K:image formation equipment, a 106:substrate, a 107:control substrate, a 109:substrate, a 200:case, a 210:sensor, a 211:substrate, 212 : A short focal lens array, 214: A stud, 215:seal glass, the source of the 217:illumination light, 218: Substrate

[Translation done.]

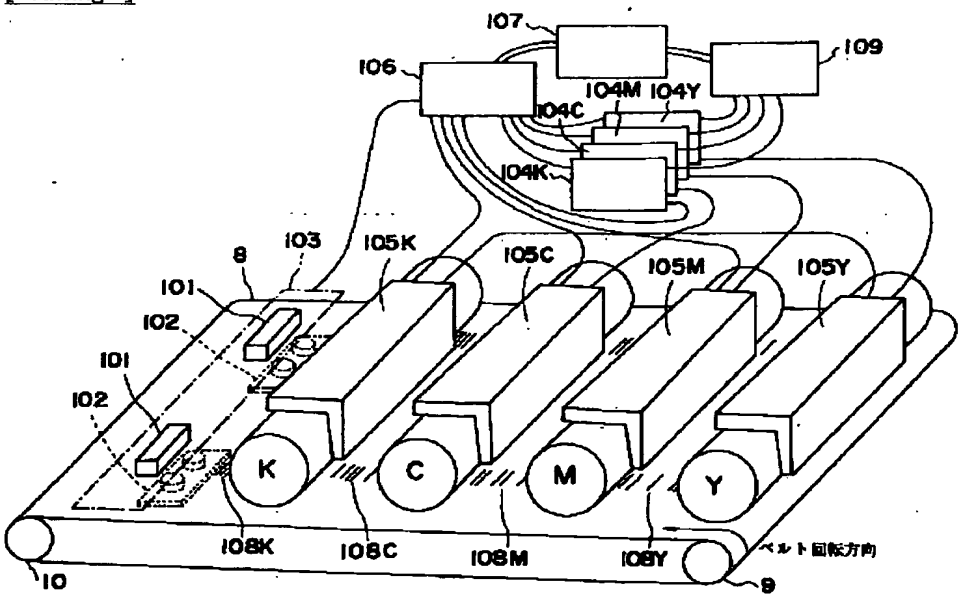
* NOTICES *

DRAWINGS

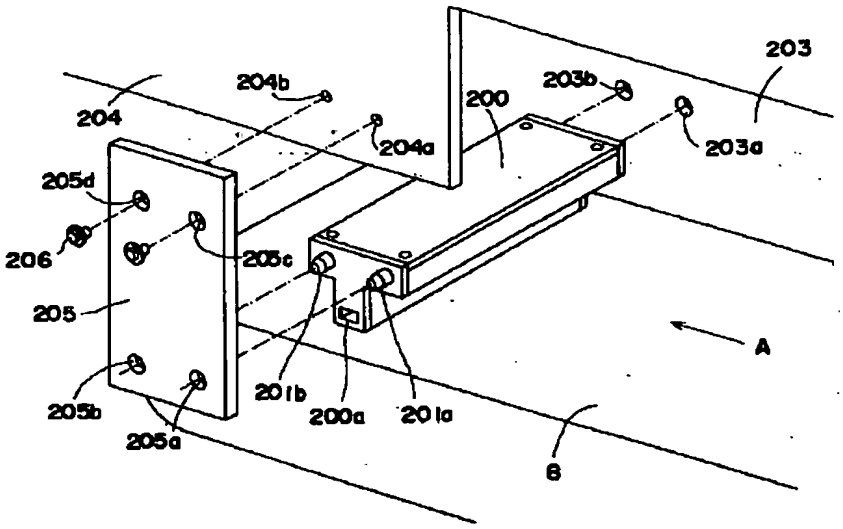
[Drawing 1]



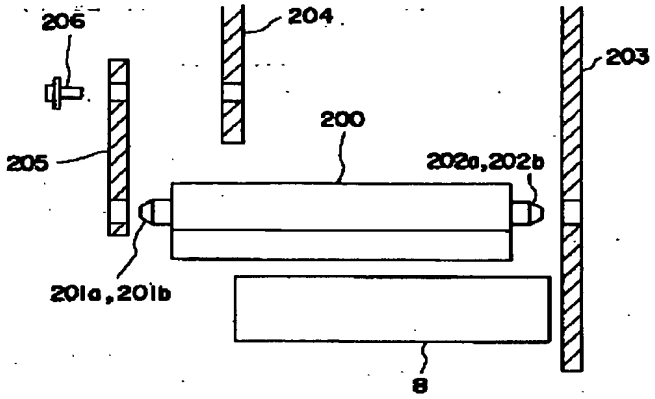
[Drawing 2]



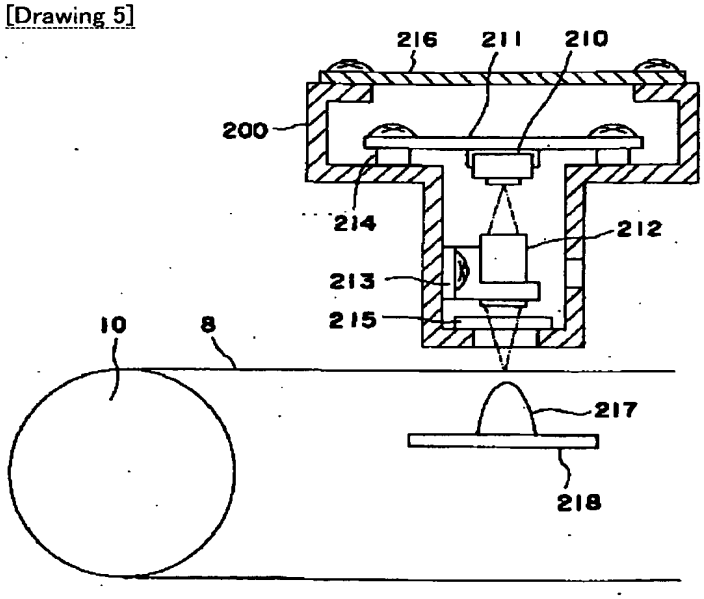
[Drawing 3]



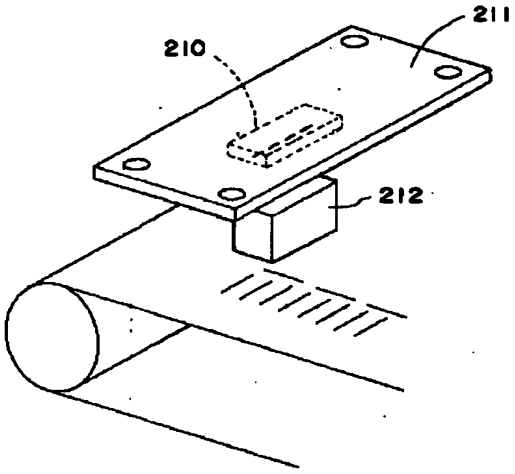
[Drawing 4]



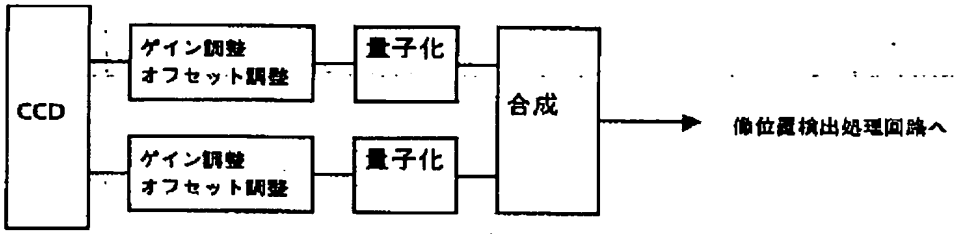
[Drawing 5]



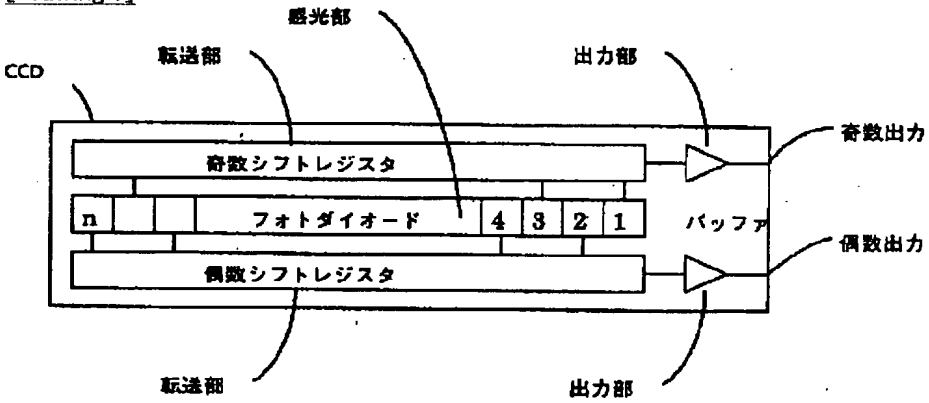
[Drawing 6]



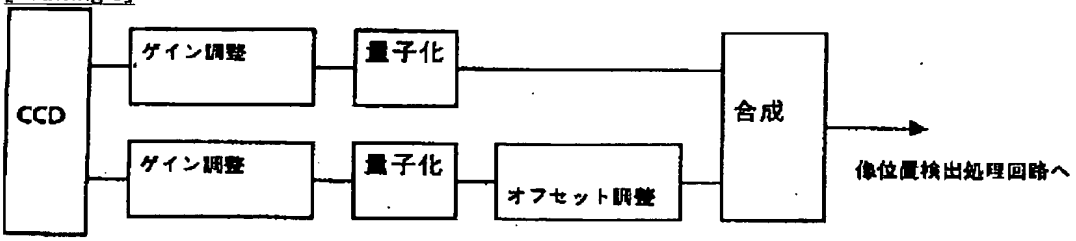
[Drawing 8]



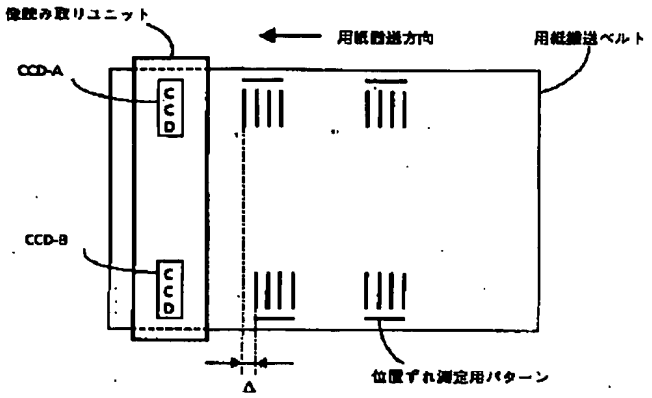
[Drawing 7]



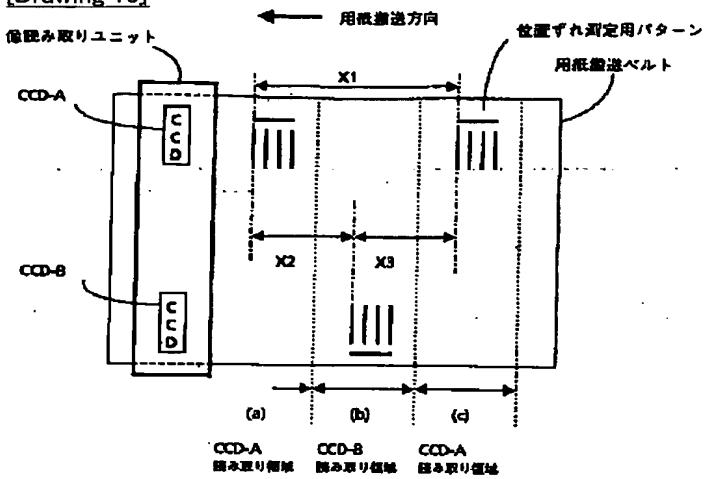
[Drawing 9]



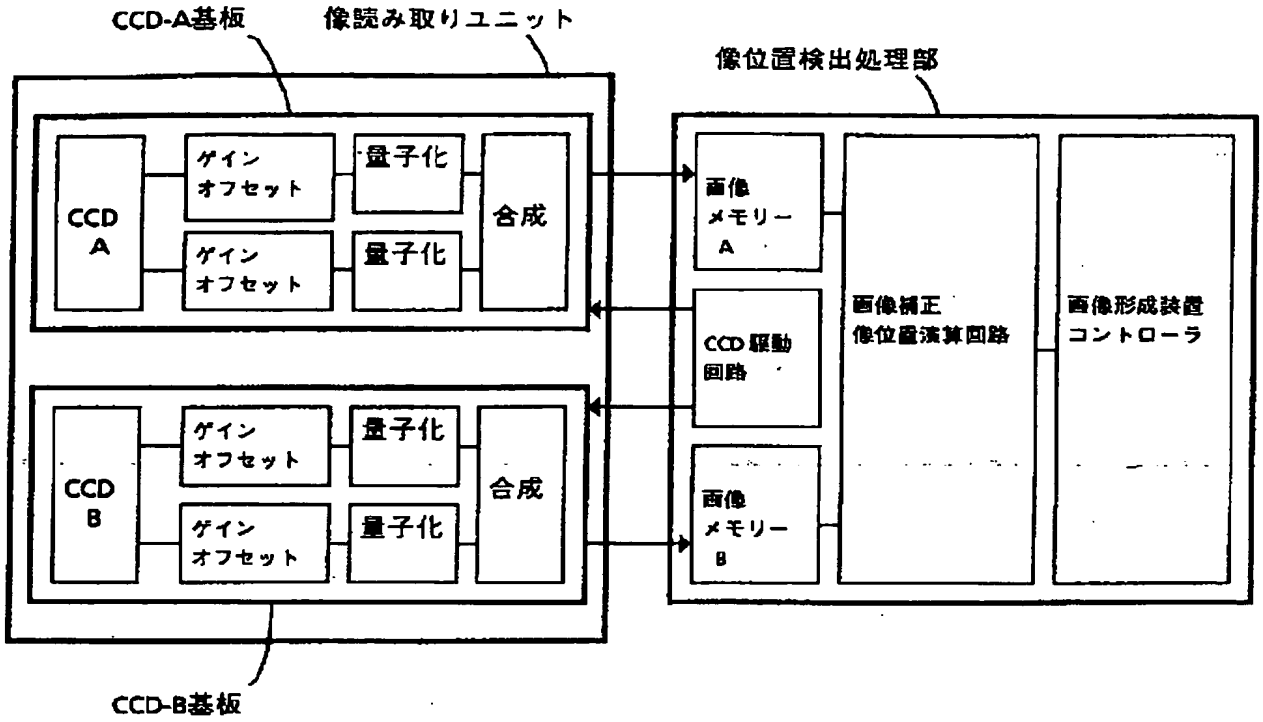
[Drawing 11]



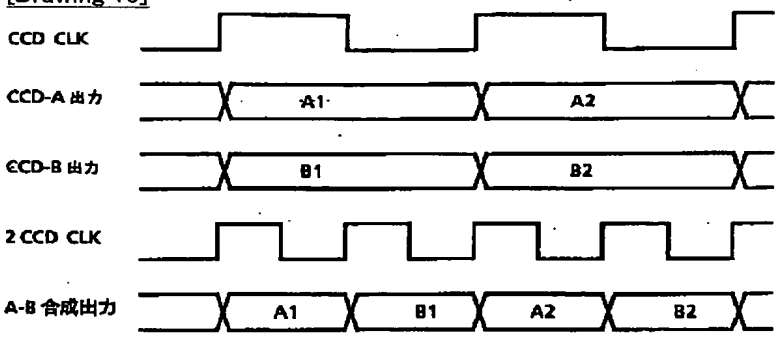
[Drawing 13]



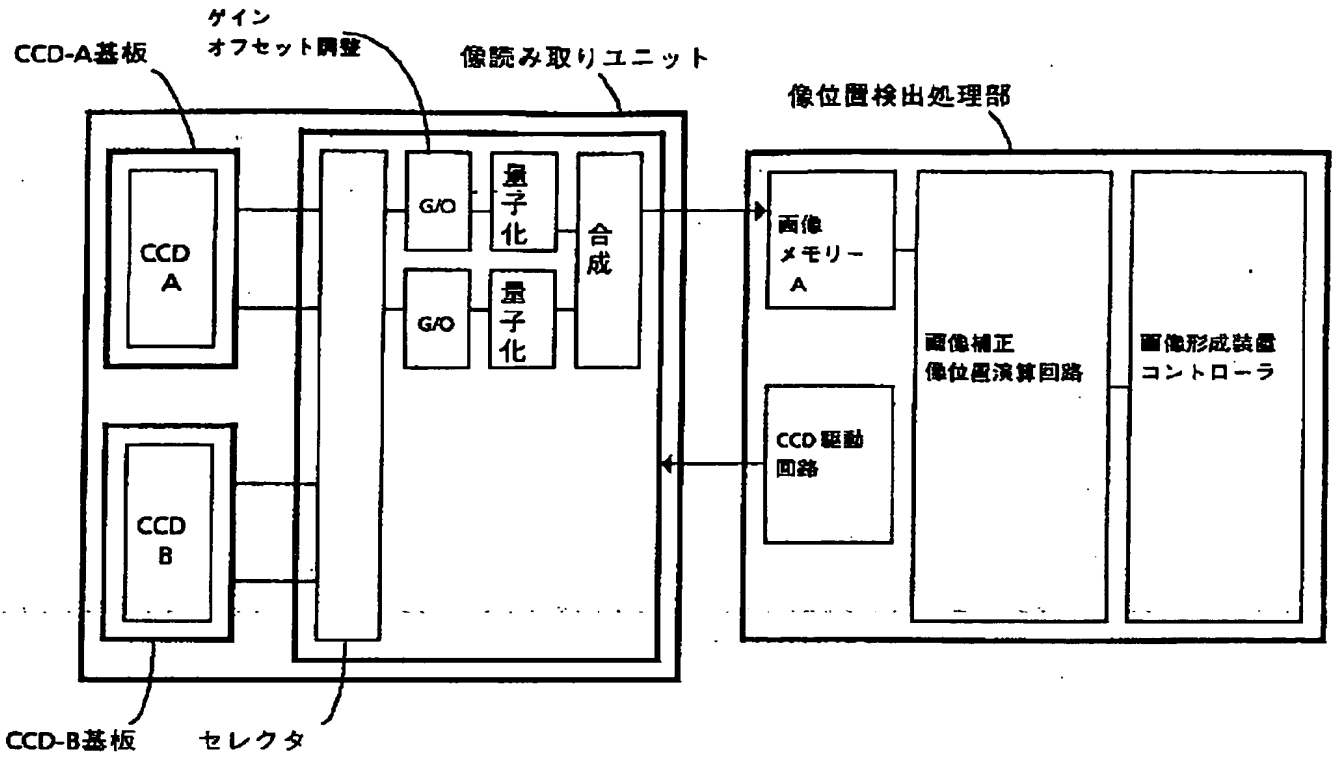
[Drawing 10]



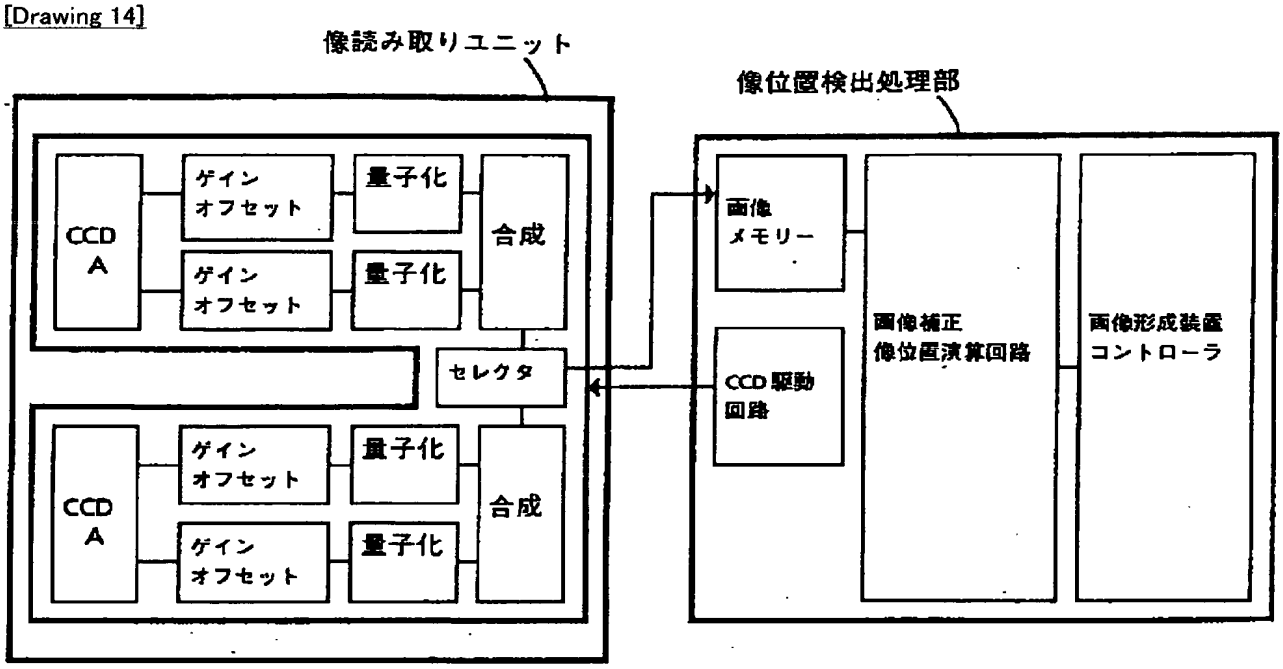
[Drawing 15]



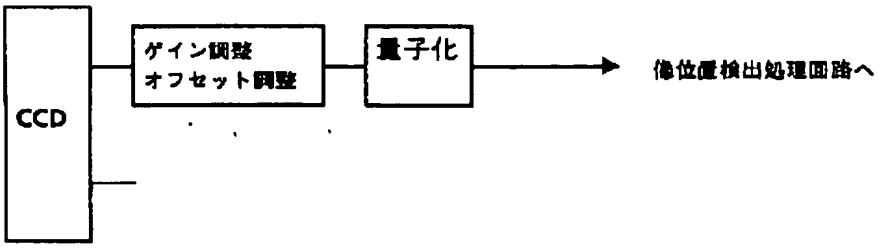
[Drawing 12]



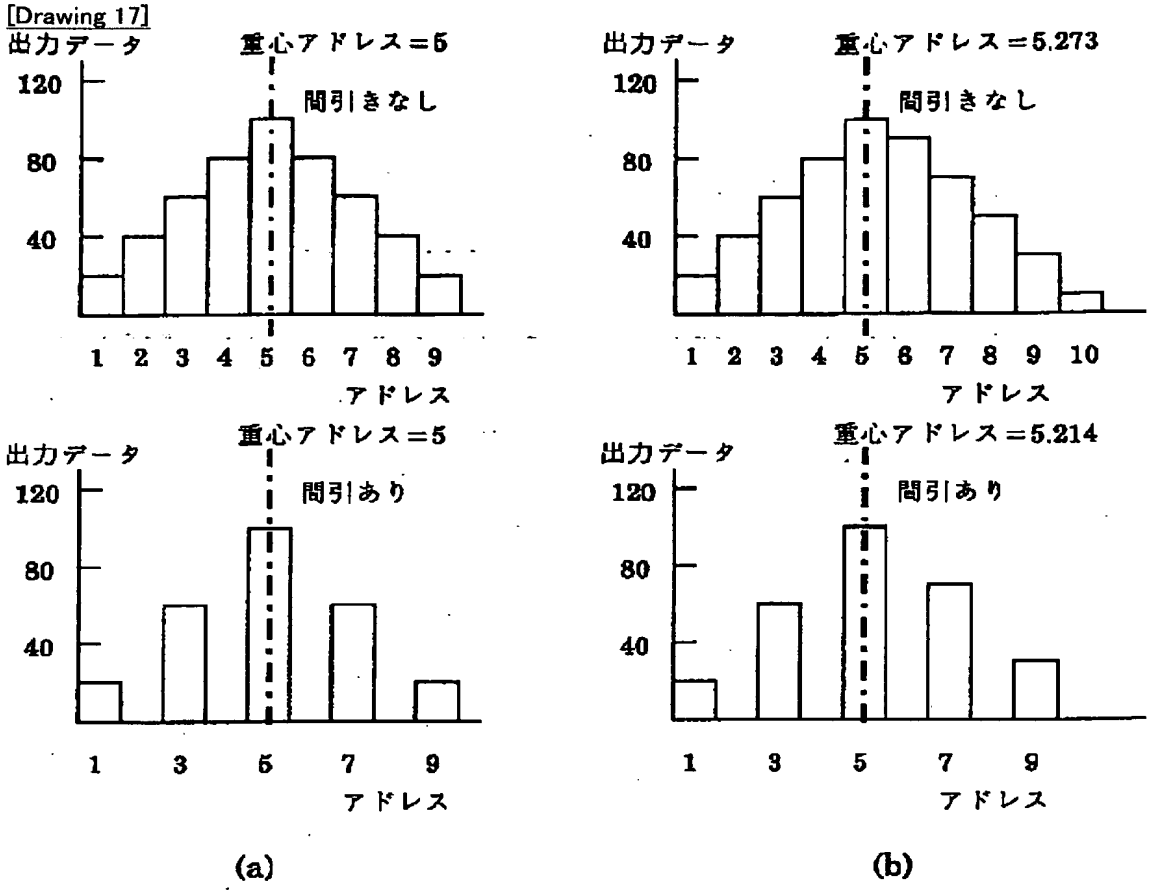
[Drawing 14]



[Drawing 16]



[Drawing 17]



(a) (b)

[Translation done.]

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Ｇ０３Ｇ　15/01	１１４　Ｚ			
			Ｂ４１Ｊ　3/00	Ｂ

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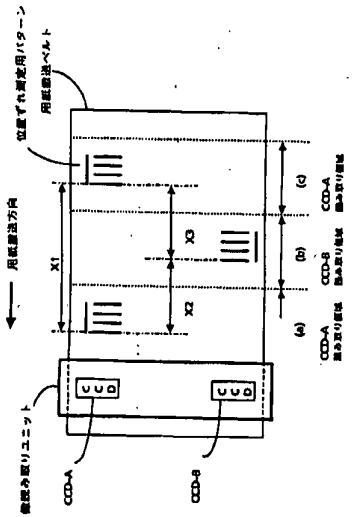
(54)【発明の名称】　画像形成装置

(57)【要約】

【目的】　多重画像形成装置において、高精度で小型で安価な像位置読み取り部を持ち、色ずれの少ない良好な画像を形成できるコンパクトな画像形成装置を提供すること。

【構成】　複数の画像形成部で形成された画像を一つの記録媒体上に順次転写搬送してカラー画像を得る多重画像形成の系と、記録媒体上の像の位置測定用パターンを検出する複数のセンサを備えた画像形成装置において、センサをそれぞれ時分割して出力し、それぞれのセンサによる像測定結果を合成して像位置測定用パターンを判別する系を備える。また、センサに代えて像の位置測定用のパターンを検出する読み取り手段を備え、読み取り手段を２個の撮像素子とするとともに、これらの撮像素子のうちいずれか一方の出力によって前記位置測定用パターンを検出する。



【特許請求の範囲】

【請求項１】　複数の画像形成部で形成された画像を一つの記録媒体上に順次転写搬送してカラー画像を得る多重画像形成の系と、前記記録媒体上の像の位置測定用パターンを検出する複数のセンサを備えた画像形成装置において、前記センサをそれぞれ時分割して出力し、それぞれのセンサによる像測定結果を合成して前記像位置測定用パターンを判別する系を備えてなる画像形成装置。

【請求項２】　前記センサの出力の時分割は、前記記録媒体上の像が転写される用紙の搬送方向に対して行う系としてなる請求項１記載の画像形成装置。

【請求項３】　前記センサの出力の時分割は、１画素毎に行う系を備えてなる請求項１記載の画像形成装置。

【請求項４】　複数の画像形成部で形成された画像を一つの記録媒体上に順次転写搬送してカラー画像を得る多重画像形成の系と、前記記録媒体上の像の位置測定用パターンを検出する読み取り手段を備えた画像形成装置において、前記読み取り手段を２個の撮像素子とするとともに、これらの撮像素子内の出力のうちいずれか一方の出力によって前記位置測定用パターンを検出する系としてなる画像形成装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、例えばレーザービーム複写機やプリンタ等の画像形成装置に係り、特に複数の画像形成部を有する多重画像形成装置に関する。

【０００２】

【従来の技術】複数の画像形成部により形成した画像を記録媒体上へ順次転写する際、転写画像位置が画像形成部ごとに理想位置よりずれていたりすると、色味が違ったり、色ずれのある画像となり、良好な画質が得られない。

【０００３】これに対し、特開昭６３－２７１２７５号公報及び特開平１－２８１４６８号公報に記載されているように、像位置検出用センサを用いることによって画質の向上を図るようにしたものがある。これは、各画像形成装置で形成された転写搬送ベルト上の像位置測定パターンを像位置検出用センサで読み取り、像位置検出処理回路によって各色のずれ量を計算した後、そのずれ量分を各画像形成装置にて補正することで色ずれの少ない良好な画像を得るというものである。

【０００４】

【発明が解決しようとする課題】しかしながら、これらの公報に記載の装置では、複数個の像読み取り手段を備えるものとすれば、像読み取り手段と像位置検出処理手段の回路規模が大型化することは避けられず、製品価格の上昇を招いてしまう。

【０００５】たとえば、像読み取り手段のセンサを撮像素子とした場合であれば、次のような障害がある。

【０００６】一般に、撮像素子は高速駆動のため出力を複数持っているため、出力部の駆動波形の差，内部容量結合及び増幅器のリニアリティーの差等によって、その複数系統の出力に差が生じる。このような出力の差を補正して適正な出力値にするためには、それぞれの出力に増幅回路やオフセット調整回路を備えることが必要であり、これだけでもかなり大規模で高価なものとなってしまう。

【０００７】更に、複数の像読み取り手段を備えるものでは、像読み取り手段の数だけ回路規模が大きくなり、ますます高価なものとなってしまう。

【０００８】また、像読み取り手段の周辺には、放電装置，ヒートローラ，現像器及びクリーナー等の電子写真プロセスを構成する主要部品が配置される。このため、レイアウトのスペースが狭くて制限されるようになり、像位置検出処理回路は像読み取り手段に隣接して配置できないことが多い。したがって、ケーブルを利用して電送する構成が採用されることになるが、複数の像読み取り手段を持つものでは電送ケーブルも複数本必要になり、像位置検出処理回部も回路規模が大きく非常に高価なものとなってしまう。

【０００９】本発明において解決すべき課題は、多重画像形成装置において、高精度で小型で安価な像位置読み取り部を持ち、色ずれの少ない良好な画像を形成できる画像形成装置を提供することにある。

【００１０】

【課題を解決するための手段】本発明は、複数の画像形成部で形成された画像を一つの記録媒体上に順次転写搬送してカラー画像を得る多重画像形成の系と、前記記録媒体上の像の位置測定用パターンを検出する複数のセンサを備えた画像形成装置において、前記センサをそれぞれ時分割して出力し、それぞれのセンサによる像測定結果を合成して前記像位置測定用パターンを判別する系を備えてなることを特徴とする。　センサの出力の時分割は、記録媒体上の像が転写される用紙の搬送方向に対して行うことができ、また１画素毎に行うようにしてもよい。

【００１１】更に、センサに代えて像の位置測定用のパターンを検出する読み取り手段を備えた画像形成装置において、読み取り手段を２個の撮像素子とするとともに、これらの撮像素子内の出力のうちいずれか一方の出力によって前記位置測定用パターンを検出する構成とすることもできる。

【００１２】

【作用】像の位置測定用のパターンを検出する複数のセンサ出力を時分割で用いることにより，ゲイン，オフセット調整回路，Ａ／Ｄコンバータ，伝送ケーブル及び像位置検出処理回路等を複数のセンサで共有することができる。

【００１３】また、読み取り手段として用いる撮像素子の奇数偶数出力のうち、片側出力だけを用いることによ

り、従来の半分の回路規模とスペースで像読み取り手段が構成でき、高精度で安価で小型で信頼性の高い像位置読み取り部をもった画像形成装置が実現できる。

【００１４】

【実施例】図１は、本発明の一実施例を示す画像形成装置の構成の概略図であり、多重転写方式のカラー画像形成装置を例として示す。

【００１５】図において、プラテン１の上に置かれた原稿２の像は、レンズ１６を通して撮像素子３に結像され電気信号として読み取られ、画像処理部４の記憶手段に一時蓄積される。

【００１６】画像処理部４からは、イエローＹ，マゼンタＭ，サイアンＣ，及びブラックＫの各色のデータが出力され、画像形成部のレーザービーム走査装置５Ｙ，５Ｍ，５Ｃ，５Ｋによってそれぞれの感光体ドラム６Ｙ，６Ｍ，６Ｃ，６Ｋに静電潜像を形成し、更に現像器７Ｙ，７Ｍ，７Ｃ，７Ｋにより可視画像化される。このとき、レーザービーム走査装置５Ｙ，５Ｍ，５Ｃ，５Ｋを組み合せたものが一つの画像形成部であり、本実施例では、５Ｙ，６Ｙ，７Ｙが例えばイエローの色を形成する装置であり、同様に５Ｍ，６Ｍ，７Ｍがマゼンタ、５Ｃ，６Ｃ，７Ｃがサイアン、５Ｋ，６Ｋ，７Ｋが黒を、それぞれ形成する装置である。

【００１７】これら各色の画像を記録する用紙１１は、用紙トレイ１２から供給される。トレイ１２を出た用紙１１は、所定のタイミングで送りローラ１３によって転写搬送ベルト８の上に送りこまれる。転写ベルト８は、定速性に優れた専用のモータ（図示せず）に連結している駆動ローラ９によって、用紙１１を排出トレイ１５に送り出す方向に駆動されている。また、駆動ローラ９と対向する側には従動ローラ１０を設け、転写搬送ベルト８に一定のテンションが掛かるように支持されている。

【００１８】転写搬送ベルト８によって搬送された用紙１１の先端と、画像形成装置によって形成された第一の感光体ドラム６Ｙ上の画像の先端は、感光体ドラム６Ｙの最下点の転写ポイントで一致するように、その紙送りタイミングや画像書き込みタイミングが決められている。

【００１９】転写ポイントに達した用紙１１は、転写用のコロトロン等によって、感光体ドラム６Ｙ上の可視画像が転写され、更に感光体ドラム６Ｍの真下の転写ポイント達する。感光体ドラム６Ｍの真下の転写に達した用紙１１は、感光体ドラム６Ｙで転写されたのと同様に感光体ドラム６Ｍ上の可視画像が転写される。同様に、Ｃ、Ｋと全ての転写を終えた用紙１１は更に転写搬送ベルト８によって搬送され、従動ローラ１０の付近まで達すると、用紙１１を転写搬送ベルト８から剥離する為のコロトロンやストリッパー等により、用紙１１が転写搬送ベルト８から剥離される。その後、定着装置１４により定着され、排出トレイ１５上に排出される。

【００２０】図２は多重転写方式のカラー画像形成装置の色ずれ補正システムの概略図である。

【００２１】図において、１０１は画像形成装置１０５Ｙ，０５Ｍ，１０５Ｃ，１０５Ｋによって形成された転写搬送ベルト８上の像位置測定用のパターン像を読み取るセンサである。これらのセンサ１０１は、図示の例では、画像領域の両端にそれぞれ配置されている。

【００２２】１０２はセンサ１０１が転写搬送ベルト８上の像を読み取るために必要な背景光を作り出す光源であり、ＬＥＤやハロゲンランプや蛍光灯等のようにセンサ１０１の光源として充分な光量を確保可能としたものである。

【００２３】１０４Ｙ，１０４Ｍ，１０４Ｃ及び１０４Ｋは、画像形成装置内のレーザービーム走査装置５Ｙ，５Ｍ，５Ｃ，５Ｋに対して画像信号を送るインターフェース基板であり、また１０６は像位置検出処理系を一括して担当する基板である。１０９はメモリー並びに画像処理関係を一括して担当する基板であり、１０７はこれらの基板の全て及び装置全体の動きを管理するコントロール基板である。

【００２４】次に、色ずれ補正システムの詳細について説明する。

【００２５】位置ずれ補正は、装置に予め設定されている専用の補正サイクルに入ることにより実行される。本装置の目的は、部品や組立てのばらつきの補正の他に、外力や温度変化等による微小なドラムの位置ずれやタイミング変動から起こる各色の色ズレを補正するものである。したがって、例えば紙詰まりが発生した後の転写装置の出し入れとか、装置内の温度変化がある一定量をオーバーしたとき等を、本装置の補正サイクルに入る開始条件とすればよい。

【００２６】補正サイクルに入ると、コントロール基板１０７から各基板１０４Ｙ，１０４Ｍ，１０４Ｃ，１０４Ｋ，１０６，１０９に指令が出され、インターフェース基板１０４Ｙ，１０４Ｍ，１０４Ｃ，１０４Ｋは、位置ずれ測定用のパターンを出力するパターンジェネレーターの役割を果たし、画像形成装置１０５Ｙ，１０５Ｍ，１０５Ｃ，１０５Ｋへ位置ずれ測定パターンが送信され、像位置検出処理基板１０６は画像形成装置１０５Ｙ，１０５Ｍ，１０５Ｃ，１０５Ｋで出力された位置ずれ測定用パターンをサンプリングする準備をする。 補正サイクルが始まると、まず初めにインターフェース基板１０４Ｙから画像形成装置１０５Ｙへ位置ずれ測定用のパターンが送信され、画像形成装置１０５Ｙで形成された位置ずれ測定用のパターンが、転写搬送ベルト８上に図示の符号１０８Ｙの転写像として転写される。インターフェース基板１０４Ｙから画像形成装置１０５Ｙで出力する位置ずれ測定用のパターンが画像形成装置１０５Ｙへ送信された後、画像形成装置１０５Ｙ，１０５Ｍの転写ポイントの距離の差に該当する一定時間後に、続

いてインターフェース基板１０４Ｍから画像形成装置１０５Ｍで出力する位置ずれ測定用のパターンが画像形成装置１０５Ｍへ送信される。画像形成装置１０５Ｍで形成された位置ずれ測定用のパターンが、転写搬送ベルト８上に転写像１０８Ｍが転写される。このとき、転写像１０８Ｍのパターンは、既に転写されている転写像１０８Ｙの上に更に画像形成装置１０５Ｍで形成された位置ずれ測定用のパターンが重ね書きされたパターンとなっている。

【００２７】同様にして、転写像１０８Ｃが形成され、全ての画像形成装置で形成された位置ずれ測定用のパターンが重ね書きされたパターンが、転写搬送ベルト８上の転写像１０８Ｋで完成される。なお、位置ずれ測定用パターンは必ずしも重ね書きとなっている必要はない。

【００２８】完成された位置ずれ測定用のパターン転写像１０８Ｋは、更に転写搬送ベルト８によって搬送され、センサー１０１の真下に達する。そして、センサー１０１からの画像データをサンプルする位置ずれ補正基板１０６では、インターフェース基板１０４Ｙ，１０４Ｍ，１０４Ｃ，１０４Ｋの位置ずれ測定用のパターン出力タイミングのうち少なくとも一つをモニターしており、その少なくとも一つのインターフェース基板の出力タイミングから、位置ずれ測定用のパターンがセンサー１０１の真下に達する時間を、予めそのインターフェース基板から出力された位置ずれ測定用のパターンを形成する画像形成装置とセンサー１０１間の間隔から、位置ずれ測定用のパターンをサンプルするのに必要かつ充分なサンプル開始タイミング及びサンプル終了タイミングを割り出すことができる。

【００２９】像位置検出処理基板１０６は、サンプル開始タイミングになると、センサー１０１からの画像信号を高速メモリーに取り込み始め、サンプル終了タイミングになると取り込みを終わる。

【００３０】取り込みを終えると同時に、次に来る位置ずれ測定用のパターンのサンプルを終了する前迄に、それらの取り込んだデータから、例えば重心法等によって像位置を確定し、それを例えば像位置アドレスとしてメインメモリーに格納する。この操作を何度か繰り返すことによって、各画像形成装置毎に幾つかの確定した像位置アドレスが得られる。ここでは確定した像位置アドレス精度を上げるために、それら幾つかの確定した像位置アドレスを、各画像形成装置毎に平均をとっている。

【００３１】次に、像位置検出処理基板１０６において、各画像形成装置毎に確定した像位置アドレスから予め決められたアルゴリズムによって、各画像形成装置間の位置ずれを補正する補正値を、幾つかの位置ずれ補正パラメーター毎に、かつ各画像形成装置毎に算出する。幾つかの位置ずれ補正パラメータとは、例えば、レーザービーム走査装置の走査開始位置即ち主走査方向のずれ，転写搬送方向即ち副走査方向のずれ，主走査方向倍率のずれ，副走査方向の倍率のずれ及び主走査方向に対する角度ずれ等がある。算出されたそれらの補正値は、像位置検出処理基板１０６から画像形成装置１０５Ｙ，１０５Ｍ，１０５Ｃ，１０５Ｋやインターフェース基板１０４Ｙ，１０４Ｍ，１０４Ｃ，１０４Ｋ等へ直接若しくは間接的に設定され、本補正サイクルは終了する。

【００３２】この補正サイクル終了後、本画像形成装置の本来の機能であるカラー画像作成作業時には、各画像形成装置間での色ずれ量を最小限に止めた良好な画像が得られる。

【００３３】ところで、この色ずれを最小限に抑えるためには、そのずれ量を検出する部分での許容色ずれ量よりも細かいレベルでそのずれ量を把握できなければ意味がない。また、商品としてのメンテナンス性や信頼性等も考慮したものでなければ、ユーザーの満足できる商品を提供できない。

【００３４】そこで、このような問題を解消し得る検出部分の構成について説明する。

【００３５】図３は像読み取り手段の構造を具体的に示す分解斜視図、図４は図３の矢印Ａ方向に見たときの要部の縦断面図である。

【００３６】図３において、筐体２００は、図２のセンサ１０１を具体的に示すものであり、装置本体から見て手前側にスタッド２０１ａ，２０１ｂを備え、奥側にスタッド２０２ａ，２０２ｂを設けている。２０３，２０４は画像形成装置のフレームである。

【００３７】筐体２００は、スタッド２０２ａ，２０２ｂをリア側のフレーム２０３の穴２０３ａ，２０３ｂにそれぞれ挿入し、スタッド２０１ａ，２０１ｂをプレート２０５の穴２０５ａ，２０５ｂに挿入し、更にプレート２０５を固定用ネジ２０６でフロント側フレームに締め付けて固定する。リアフレーム２０３の穴２０３ａ，２０３ｂ及びフロントフレームの穴２０４ａ，２０４ｂは転写搬送ベルト８からの距離及び同芯のアライメントがある規格値以内になる様に管理された寸法で開けられている。

【００３８】このような構成により、筐体２００は画像形成装置のフレームに対して簡単に着脱可能であり、しかもその時に転写ベルトと筐体上のスタッドの位置関係が、ある規格値内に収まるような形となる。従って、組立て作業や設置後のメンテナンスの容易化、短縮は勿論のこと、もしも設置後に検出部の故障により交換という作業があったとしても本筐体の交換のみで対処でき、煩わしく時間のかかる調整作業などは一切発生しない。

【００３９】図５は転写搬送ベルト８と共に示す像読み取り手段の筐体２００の内部構造の縦断面図であり、図６はセンサ基板２１１，短焦点レンズアレイ２１２及び転写搬送ベルト８上のトナー像の位置関係を立体的に示す図である。

【００４０】図において、２１０は撮像素子であり、２

１１はセンサ２１０の駆動回路と周辺回路を載せた基板である。また、２１２は短焦点レンズアレイであり、２１８は照明光源２１７とその周辺回路を載せた基板である。

【００４１】筐体２００上には、センサ基板２１１と短焦点レンズアレイ２１２のペアを２個並べている。センサを２個使うことで、主走査方向のずれ，副走査方向のずれ，倍率誤差及び主走査方向に対する角度ずれ等の色ずれの全ての方向での調整が可能となる。例えば、副走査方向の調整のみを行うのであれば１個でも良いし、各色ごとにセンサを使うのであれば４個というように、センサの数はいくつでも良いのは言うまでもなく、エリアセンサを使ってもよい。

【００４２】更に、２１３は短焦点レンズアレイ２１２を保持する部材であり、筐体２００に対し上下方向に調整可能である。また、センサ基板２１１は、筐体２００に固定されているスタッド２１４に対し調整可能となっている。このような機構を持つことにより、筐体２００上でセンサ２１０と短焦点レンズアレイ２１２の位置関係を任意に調整でき、要求性能に見合った所望の精度にて取り付けることが可能となる。

【００４３】ここで、精度の良い像位置検出を行うため読み取り手段にＣＣＤを用いた場合について説明する。

【００４４】図７に一般的なＣＣＤの構成を示す。

【００４５】ＣＣＤラインセンサは、図７に示すように、感光部と転送部と出力部をもち、転送部には集積度を高め転送損失を少なくするため、２列のレジスタを備えている。そして、ｎ画素内でそれぞれ奇数番号画素と偶数番号画素の信号電荷の転送を受け持ち、それぞれの出力部を経由して奇数出力、偶数出力として外部に出される。

【００４６】ところが、出力部の駆動波形の差，内部容量結合及び増幅器のリニアリティーの差等によって、その２系統の出力に差が生じる。高速駆動する場合は、更にアナログ処理時のサンプルホールドの微妙なタイミングによっても出力差が生じてしまう。

【００４７】このような出力差を補正して適正な出力値にするためには奇数及び偶数のそれぞれに増幅回路及びオフセット調整回路を持つ必要があり、更には、量子化回路も２系統必要である。

【００４８】図８に従来のＣＣＤの信号処理回路のブロック図を示す。

【００４９】ＣＣＤの奇数及び偶数それぞれの出力にゲイン及びオフセット調整回路があり、量子化する際の基準電圧に合わせられる。複数のＣＣＤ、例えば２つのＣＣＤの場合では、ゲイン及びオフセット調整回路と量子化回路が４系統必要である。オフセット調整回路は、量子化の際に飽和しないレベルであれば、奇数または偶数どちらか片方の出力だけに付加し、ある一定の値を加算または減算し、偶奇の相対的な差を補正してやってもよい。

【００５０】また、オフセット調整回路は、図９に示すブロック図のようにに量子化の後に付加してもよいし、奇数または偶数の合成後でも可能である。そして、その補正値はＣＣＤによってばらつきがあるため可変できる方がよい。

【００５１】図１０に従来の複数のＣＣＤを用いた読み取りユニットと像位置検出処理回路のブロック図を示す。

【００５２】像読み取りユニット内には、ＣＣＤ－Ａ基板とＣＣＤ－Ｂ基板が内蔵されており、それぞれ転写搬送ベルト８の進行方向と直角方向に取り付けられている。その間隔は出来るだけ広い方が画像領域の傾き検出精度が良くなるが、転写搬送ベルト８の汚れ，撓み，反り及び振動等の影響も考えて選定する。そして、ＣＣＤ－ＡとＣＣＤ－Ｂは、予め治具上で平行になるように調整され、それぞれに前記の信号処理回路を内蔵し、ゲイン及びオフセット調整回路と量子化回路が４回路内蔵されている。

【００５３】ＣＣＤ駆動信号は２つのＣＣＤと同期をとる必要があるため、同じ駆動信号がそれぞれのＣＣＤに送られる。更に、そのＣＬＫは、レーザービーム走査装置のＣＬＫとも同期がとられ、周波数はその整数倍かになっている。読み取られたＣＣＤ－Ａの画像信号は像位置検出処理部内の画像メモリーＡに、ＣＣＤ－Ｂの画像信号は像位置検出処理部内の画像メモリーＢに、それぞれ必要なエリアだけ、必要ならば補正がなされて記録される。次に画像メモリーＡ、画像メモリーＢの信号はＣＰＵで光量ムラ補正などがされて、各色の像位置の差の検出、ＣＣＤ－ＡとＣＣＤ－Ｂの像位置の相対的なずれ量が検出され画像形成装置コントローラによって各色の像転写位置が制御され、色ずれのない良好な画像を得ることができる。

【００５４】この場合、画像領域内での傾きは、図１１に示すように画像形成部より同一時に用紙搬送帯に転写された像の重心の差Δで表せる。

【００５５】これに対し、本発明では以下の色ずれの検知を行う。

【００５６】２個のＣＣＤを用いる場合について考える。ＣＣＤセンサが転写搬送ベルト８の進行方向と直角方向に取り付けられているのは、画像領域内での像傾きや倍率誤差を検出するためである。これに対して、図１３に示すように、ＣＣＤ－ＡとＣＣＤ－Ｂを時分割で用いてもそれらを検出することができる。

【００５７】すなわち、同一のＣＣＤ内で読み取った位置ずれ測定用パターン間隔Ｘ１より、用紙搬送方向の倍率が求まれば、ＣＣＤ－ＡとＣＣＤ－Ｂ間の正常時の位置ずれ測定用パターン間隔を知ることができる。そして、このパターン間隔とＣＣＤ－Ａ及びＣＣＤ－Ｂとの間の実際の位置ずれ測定用パターン間隔Ｘ２やＸ３との

差をとれば、画像領域内での傾きを求めることができる。

【００５８】なお、測定に際しては、何か所かの平均をとるのが好ましい。また、用紙搬送方向の倍率がずれていなければ、理論上のパターン間隔と実際の値を比較すればよい。

【００５９】ＣＣＤ－ＡとＣＣＤ－Ｂを図１３の（ａ），（ｂ），（ｃ）のように、像位置測定パターンの周期で交互に切りかえて用いることにより、従来４回路必要であったゲイン及びオフセット調整回路と量子化回路を、図１２に示すように半分の２回路に減らすことができる。このため、電気部品及びスペースの削減が可能となり、像位置検出処理部とのインターフェース信号数も半分になる。したがって、ケーブルやコネクタのピン数を減らすことができ、メモリが少なくて済み、画像位置検出処理部のデータ幅も小さくなり回路削減することができ、コストの大幅な低減と信頼性を向上することができる。

【００６０】また、ゲイン及びオフセット調整を２回路と量子化合成回路をＬＳＩ化した汎用の素子を使えば、もっとスペースを削減でき信頼性を上げることができる。図１２ではＣＣＤ出力直後で信号を時分割しているが、量子化後でもよい。また、図１２では、ＣＣＤ駆動回路は像位置検出処理部上にあるが、像読み取りユニット内にあってもよい。

【００６１】ここで、転写搬送ベルト８上の像位置測定パターンの読み取り手段周辺には、感光ドラムの帯電及び除電用，転写及び用紙剥離用などの放電装置が配置され、これらは数１００～数１０００Ｖで放電する。これに対して、読み取り手段内のセンサ出力信号レベルは数１００ｍＶとその１０００分の１程度であり、ＣＣＤアナログ出力信号を長く伝送する場合、そのまま伝送すると放電装置のノイズにより影響を受けてしまう。Ａ／Ｄコンバータの入力電圧レベルまで増幅したとしても周辺装置の電圧レベルと比較して非常に小さく、ノイズの影響をうけてしまう可能性がある。

【００６２】ここで、センサどうしの間が離れているときは、量子化後データを伝送したほうがよい場合がある。このような条件に対しては、図１４の構成とすることが有効である。

【００６３】すなわち、ＣＣＤ－Ａ部とＣＣＤ－Ｂ部とを平行度を保ったまま独立に可変できる様にフレキシブルな基板またはケーブルで接続し、像読み取りの最適ピント位置に合わせるように個別に調整する。

【００６４】この場合、ゲイン及びオフセット調整回路と量子化合成回路とは削減できないが、像読み取りユニットから像位置処理部までのケーブルを削減でき、コストダウンが図れる。また、ゲイン及びオフセット調整と量子化合成回路とにＬＳＩ化した汎用の素子を使ってもよい。

【００６５】更に異なる時分割の方法として、図１５の様にエリア毎ではなく１画素毎にＣＣＤ－Ａ出力とＣＣＤ－Ｂ出力とを合成して像位置検出部に送る方式も考えられる。

【００６６】この方式では、ビデオレートが２倍になるが、ＣＣＤ－Ａ出力とＣＣＤ－Ｂ出力とを同時に比較し、画像領域内の傾きを検出することができるのが利点である。したがって、ビデオレートが遅いシステムに向いている。この方式も前出の時分割と同様にゲイン、オフセット調整後のアナログでの合成方法とデジタルでの合成方法が考えられる。

【００６７】次に、読み取り撮像素子の複数出力の内、どちらか片方の出力だけを用いて像を読みとり色ずれを検出する方法について説明する。

【００６８】図１６はこの検出方法のためのブロック図である。

【００６９】図８のブロック図と比較すると、片チャネル分のゲイン，オフセット調整回路，量子化回路及び合成回路を省いた系とした点が相違している。

【００７０】図７で説明したように、ＣＣＤの信号出力は奇数出力、偶数出力の二つに別けて外部に出される。しかし、出力部の駆動波形の差，内部容量結合及び，増幅器のリニアリティーの差などによって、その２系統の出力に差が生じる。これを補正し適正な出力値にするためには、奇数，偶数のそれぞれに増幅回路及びオフセット調整回路を持つ必要があり、更には量子化回路も２系統必要であった。ＣＣＤによっては、奇数偶数が内部で合成された出力を持ったものもあるが、結局、奇数偶数の出力差があることには変わりなく、同一のゲイン及びオフセット調整回路を通してしまうと、奇数偶数出力差が存在するままになってしまい、デジタルでのシェーディング補正やダーク補正を実施しても像位置検出時に誤差が生じる可能性があるうえ、ビデオ処理回路に要求されるスピードも２倍になってしまう。又、単一の転送部と、単一出力を持ったＣＣＤもあるが、画素サイズが大きかったり、画素数が少なかったり、高価であったりする。

【００７１】これに対し、本実施例のような構成では、汎用のＣＣＤを用いても、出力は全て共通の回路を通るので差が生じ得ないし、ビデオ処理回路のスピードも合成出力時の半分でよい。ＣＣＤの有効画素を間引いて使っていることになるが、読み取っている一画素の大きさは変わらないので、像位置データが左右均一な分布をしていれば、画素を間引かない場合と同じ結果が得られる。また、像位置データが左右不均一な分布であっても、重心法などの像位置検出アルゴリズム等を用いることにより、画素を間引かない場合と殆ど同じ結果が得られ、一画素が光ビーム走査装置の制御ステップに対してかなり小さければ無視出来る誤差である。

【００７２】また、像位置検出精度は読み取った像の中

に含まれるデータの数を多くすることによって、更に向上することが出来る。すなわち、センサの読み取り画素サイズを小さくして解像度を上げたり、読み取り像の幅を太くしたりすることで、精度は向上する。たとえば、１４ｕｍの精度で像位置データを読み取りたいならば、その半分の画素サイズである７ｕｍのセンサを用い、その片チャネルのみ動作させればよい。この場合、ＣＣＤの画素サイズが小さくなったことにより、感度が低下するが、ＣＣＤの解像度があまり小さくなっても短焦点レンズアレイの解像度が追従できないため、リセット信号を通常の１／２に間引き、露光量を２倍にして使う方法もある。尚、副走査方向には解像度の劣化は生じない。

【００７３】以上のことを図１７に例を挙げて示す。

【００７４】同図（ａ）のように、左右対称な分布を持つ像位置データの場合は、有効画素の間引きが無いときと有るときの結果は全く同じとなり、重心法にて像位置の重心のアドレスを求めると、重心はアドレス５の位置となる。

【００７５】これに対し、同図の（ｂ）のように、左右非対称な分布を持つ像位置データの場合では、重心法によって像位置の重心のアドレスを小数点以下３桁まで求めると、間引き無しのときの重心アドレスは５．２７３となり、間引きありの時の重心アドレスは５．２１４であり、その差は０．０５９となり、１４ｕｍ画素サイズのセンサを用いていた場合は、０．８２６１ｕｍと１ｕｍ以下の誤差であり、無視できる値である。

【００７６】次に、読み取り手段を用紙搬送方向と直角方向に機械的走査する方法について説明する。

【００７７】複数の像読み取り手段を時分割で使うのに代えて、一つの像読み取り手段を用紙搬送方向と直角方向に機械的走査させ、必要な像読み取り位置に移動させることによって、複数の像読み取り手段を持った場合と同様の性能を得ることができる。

【００７８】たとえば、図１３において、ＣＣＤ－Ａで位置ずれ測定用パターンの（ａ）区間を読み取った後、ＣＣＤ－ＡをＣＣＤ－Ｂがあるべき位置まで移動させ、位置ずれ測定用パターンの（ｂ）区間を読み取らせ、又ＣＣＤ－Ａの位置まで戻り、位置ずれ測定用パターンの（ｃ）区間を読み取らせるといった様にすればよい。この際、位置ずれ測定用パターンの出力間隔（Ｘ２），（Ｘ３）は、ＣＣＤ－ＡがＣＣＤ－Ｂがあるべき位置まで移動し、静止して安定する時間より大きくすればよい。

【００７９】なお、本実施例では、透明な転写ベルト材による透過照明型での構成について説明したが、ベルト材が不透明であれば、照明ランプも筐体上に取り込んだ形とすることで同じような効果を得ることができる。

【００８０】

【発明の効果】本発明では、像の位置測定用のパターンを検出する複数のセンサ出力を時分割で用いることにより、センサに関する回路や伝送ケーブル等を共有した構成とすることができる。したがって、少ない部品及び簡易な回路によって装置の簡略化及びコストの削減が可能となる。

【００８１】また、読み取り手段として用いる撮像素子の奇数偶数出力のうち、片側出力だけを用いることにより、従来の半分の回路規模とスペースで像読み取り手段が構成できる。したがって、小型で精度も高い像の位置読み取りが可能となり、よりコンパクトな画像形成装置を提供できる。

【図面の簡単な説明】

【図１】本発明の画像形成装置の一実施例を示す概略構成図である。

【図２】多重転写方式のカラー画像形成装置の色ずれ補正システムの概略図である。

【図３】図２の検知部の具体的な構成例を示す要部の分解斜視図である。

【図４】図３の矢印Ａ方向に見た要部の縦断面図である。

【図５】転写搬送ベルトと共に示す読み取りユニットの縦断面図である。

【図６】筐体の中に納めるセンサ基板と短焦点レンズアレイ及び転写ベルト上のトナー像の位置関係を説明するための概略斜視図である。

【図７】ＣＣＤの一般的な構成を示す図である。

【図８】従来のＣＣＤの信号処理回路のブロック図である。

【図９】オフセット調整回路を備えた信号処理回路のブロック図である。

【図１０】従来の複数のＣＣＤを用いた像位置処理回路のブロック図である。

【図１１】読み取り手段による像位置の検出の要領を示す従来例の図である。

【図１２】本発明における像位置処理回路のブロック図である。

【図１３】本発明における読み取り手段の像位置検出の要領を示す図である。

【図１４】本発明における像位置処理回路の別の例を示すブロック図である。

【図１５】時分割のパターンの一例を示す図である。

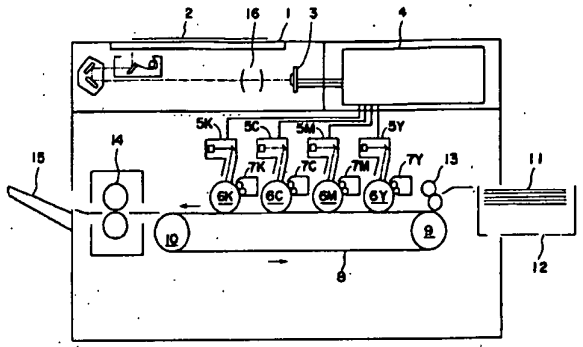
【図１６】撮像素子の片方のみを用いて色ずれを検出する方法を示すためのブロック図である。

【図１７】像位置データの分布のパターンの例を示す図である。

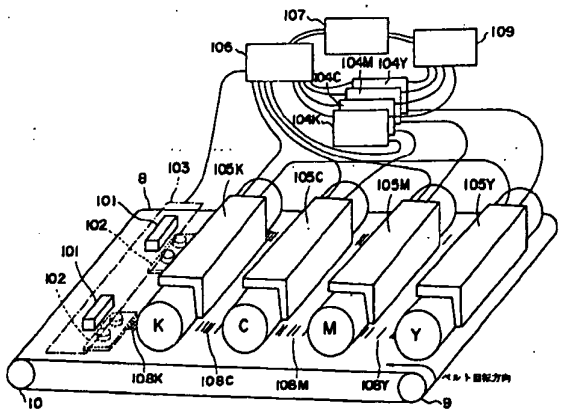
【符号の説明】

１：プラテン，２：原稿，３：撮像素子，４：画像処理部，５Ｙ，５Ｍ，５Ｃ，５Ｋ：レーザービーム走査装置，６Ｙ，６Ｍ，６Ｃ，６Ｋ：感光体ドラム，７Ｙ，７Ｍ，７Ｃ，７Ｋ：現像器，８：転写搬送ベルト，９：駆動ローラ，１０：従動ローラ，１１：用紙，１２：用紙トレイ，１４：定着装置，１５：排出トレイ，１０１：センサ，１０２：光源，１０４Ｙ，１０４Ｍ，１０４Ｃ，１０４Ｋ：インターフェース基板，１０５Ｙ，１０５Ｍ，１０５Ｃ，１０５Ｋ：画像形成装置，１０６：基板，１０７：コントロール基板，１０９：基板，２００：筐体，２１０：センサ，２１１：基板，２１２：短焦点レンズアレイ，２１４：スタッド，２１５：シールガラス，２１７：照明光源，２１８：基板

【図１】



【図２】



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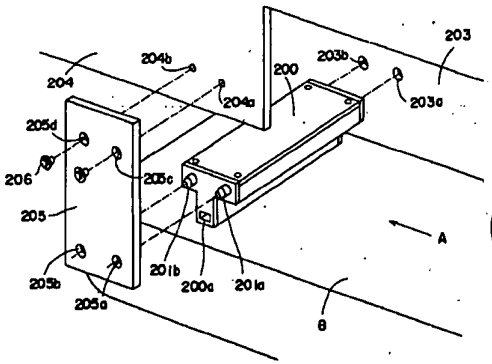
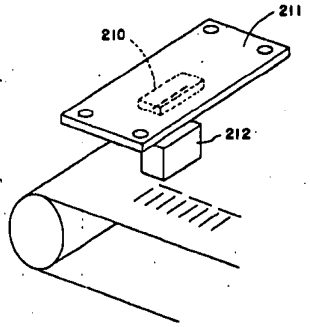
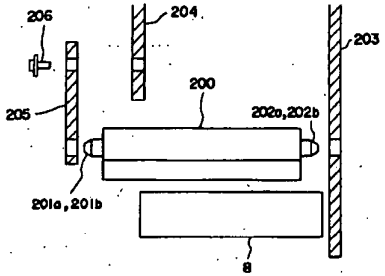


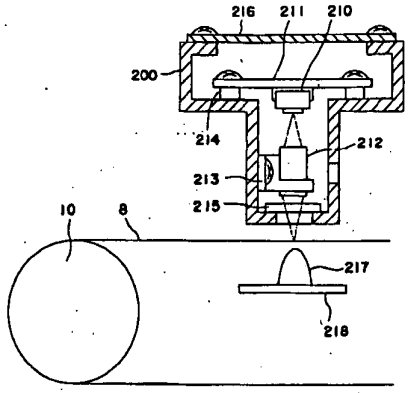
【図6】



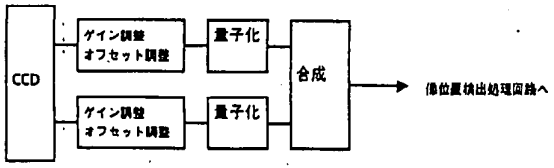
【図4】



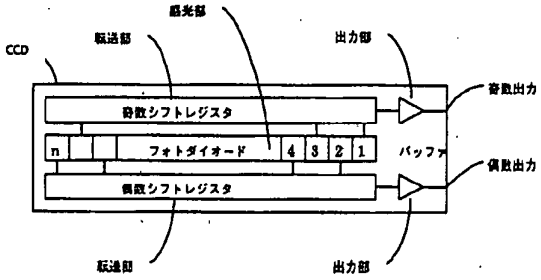
【図5】



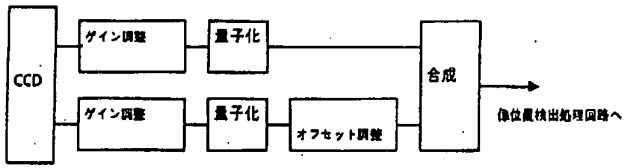
【図8】



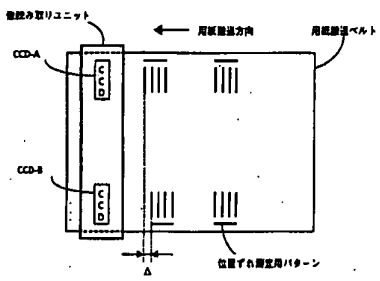
【図7】



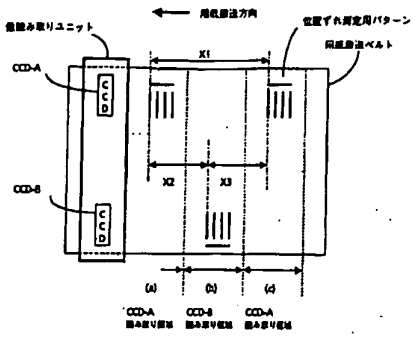
【図9】



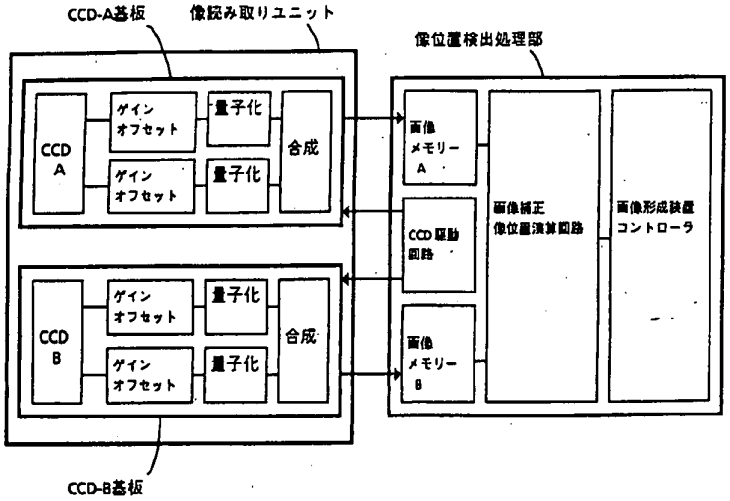
【図11】



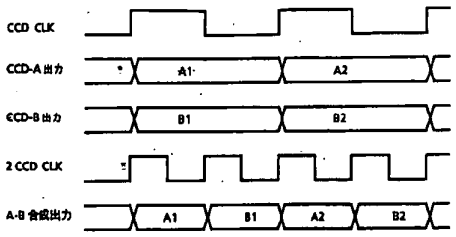
【図13】



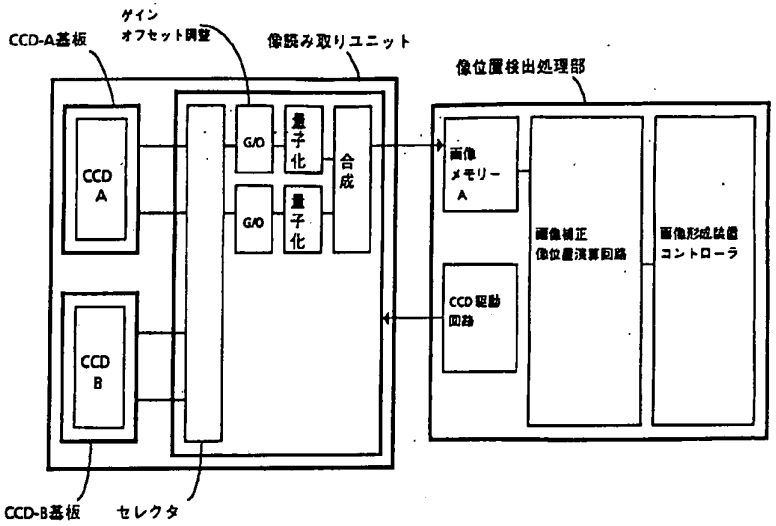
【図１０】



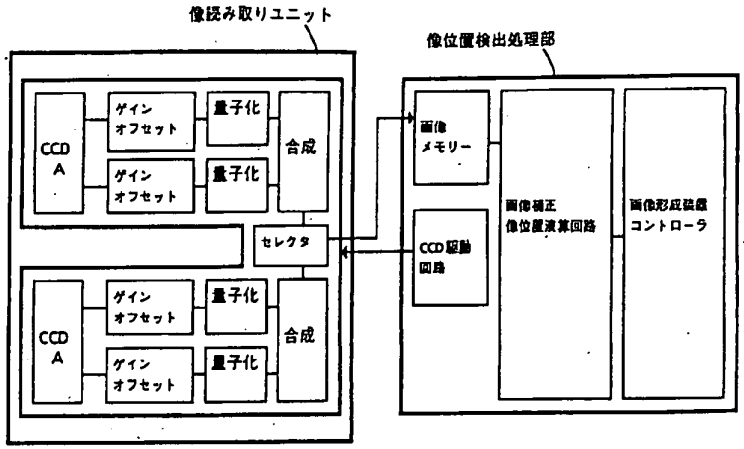
【図１５】



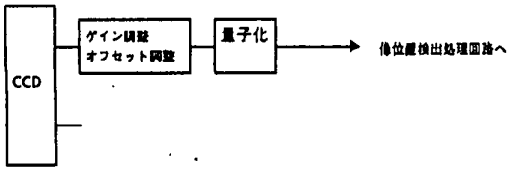
【図１２】



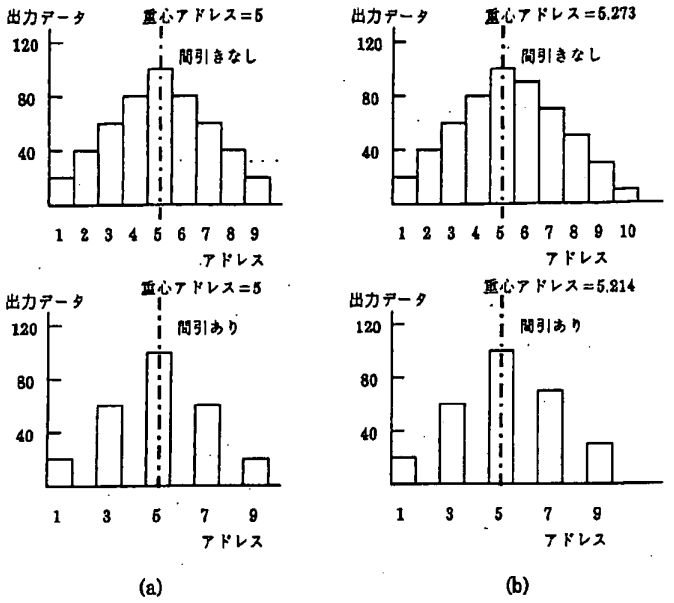
【図１４】



【図16】


CCD
ゲイン調整
オフセット調整
量子化
像位置検出処理回路へ

【図17】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間引きなし
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80
40
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アドレス
出力データ
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間引きなし
120
80
40
1 2 3 4 5 6 7 8 9 10
アドレス
出力データ
重心アドレス=5
間引きあり
120
80
40
1 3 5 7 9
アドレス
出力データ
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間引きあり
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80
40
1 3 5 7 9
アドレス

(a)　　(b)